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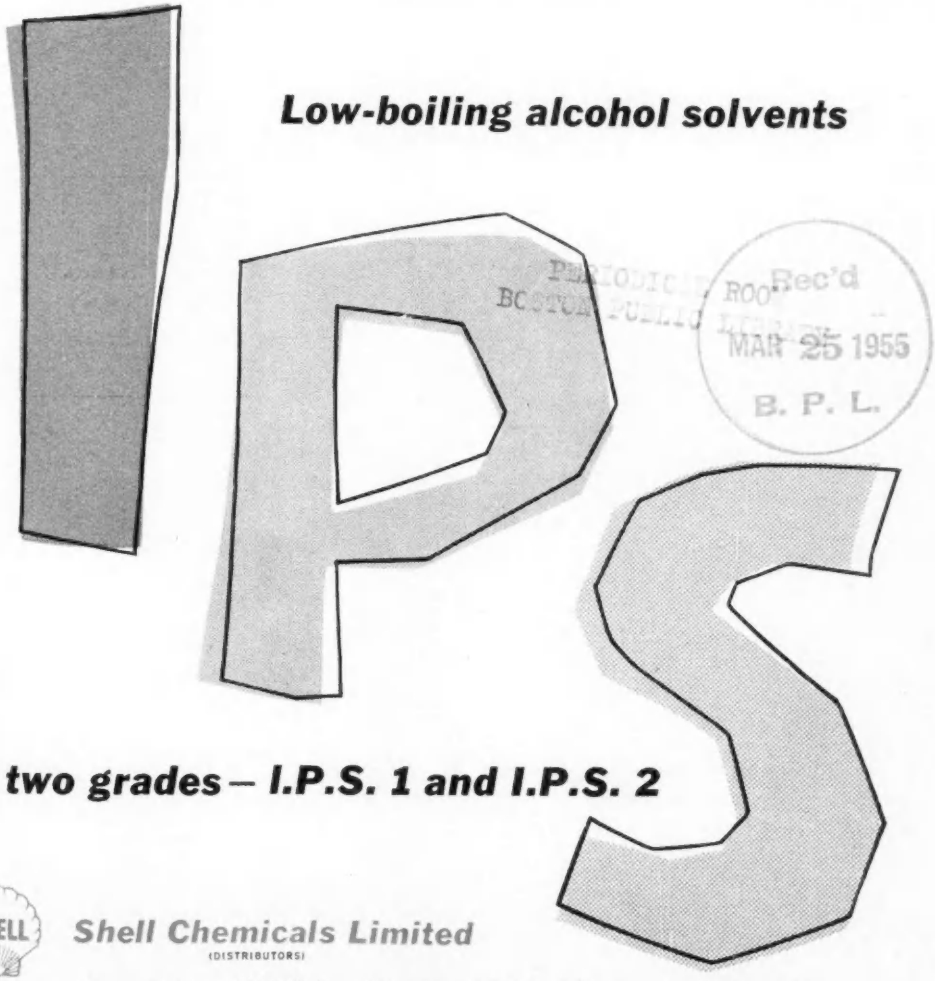
THE Chemical Age

VOL. LXXII 12 MARCH 1955 No. 1861



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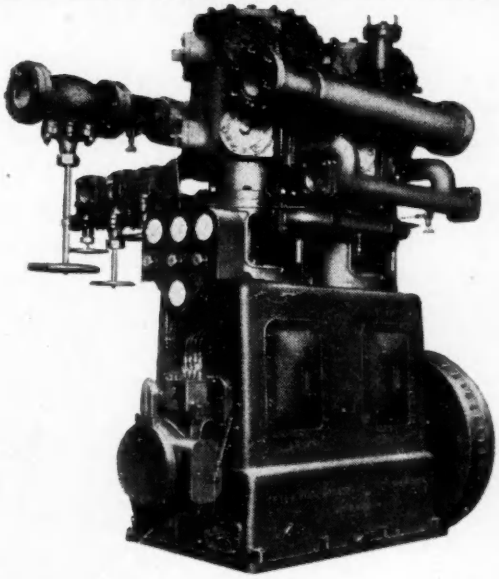

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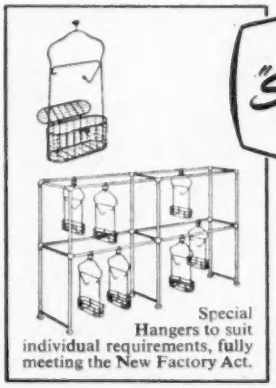

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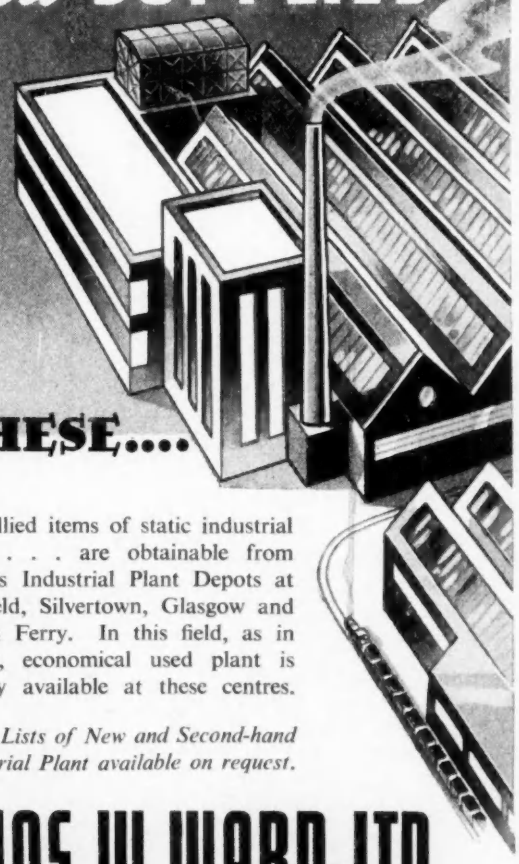

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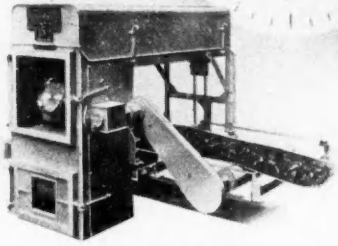

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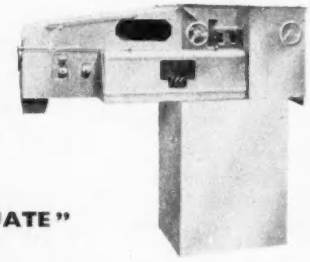

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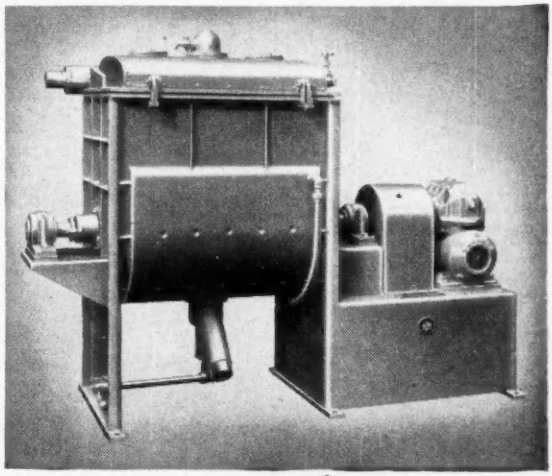

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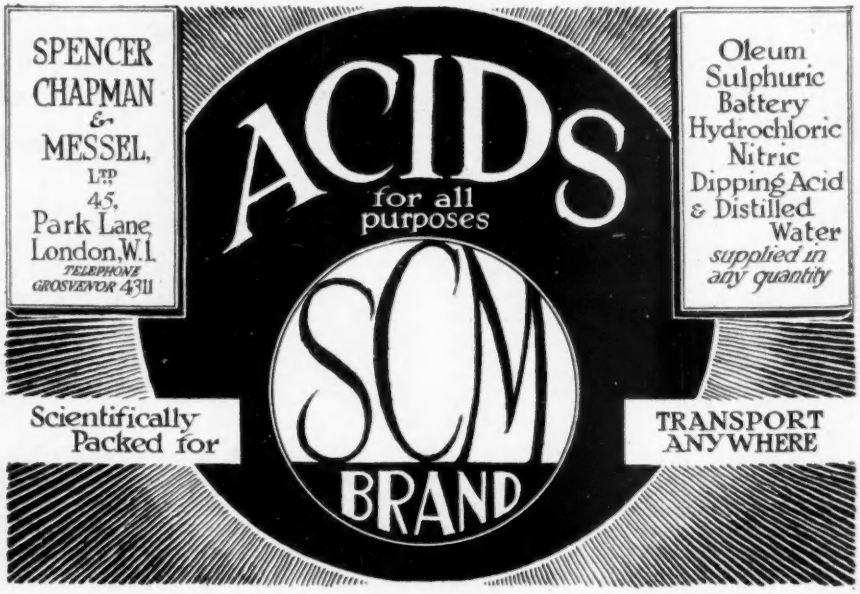

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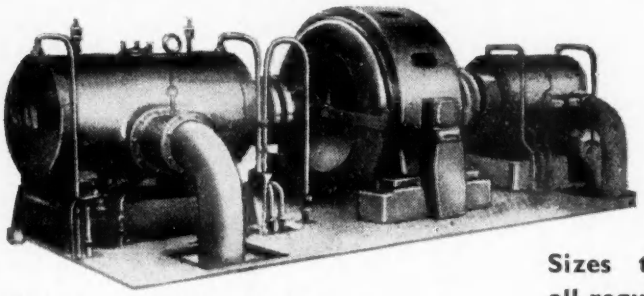

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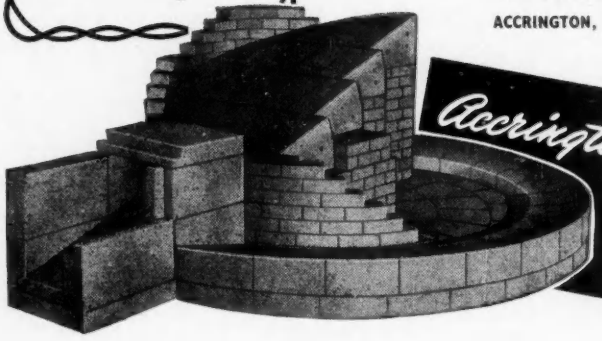

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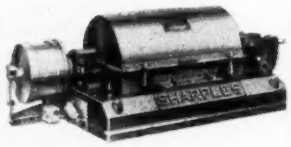

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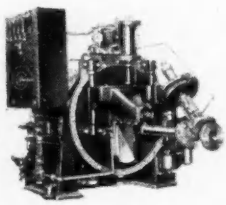

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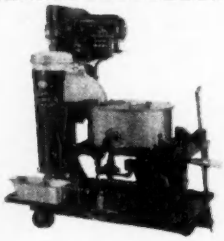

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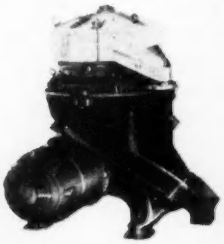

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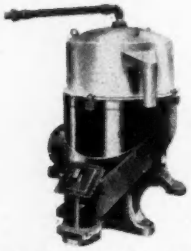

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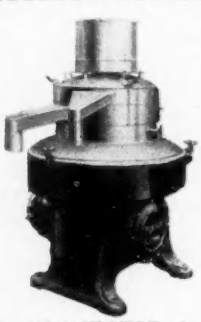

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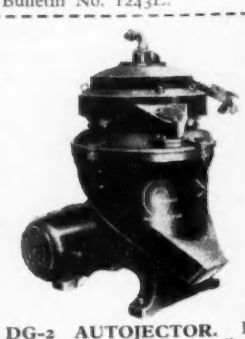

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The Teaching Task

THREE months ago (see THE CHEMICAL AGE, 1954, **71,** 1179) the topic discussed in these columns was an article by an American teacher of chemistry written after he had taken part in the Anglo-US interchange of teachers. It is possible now to look at the same subject observed from a reversed position, the teaching of chemistry in US schools analysed by an English teacher visiting America. Mr. O. J. Simpson, of the County High School, Wanstead, has reported upon his 1953/54 experiences in the *Journal of the Royal Institute of Chemistry* (1955, **79,** 4 and 55). It is difficult not to feel some disquiet if not alarm on reading Mr. Simpson's two-part paper. The respect for our chemistry teaching standard in the schools that Mr. Campbell, of Ohio, expressed so frankly is confirmed by Mr. Simpson's findings—e.g. 'By comparison with a British grammar school the academic standards attained in these public schools (US high schools) are about two years behind.' It was perhaps easier for Mr. Campbell to be outspoken with praise than for Mr. Simpson to be outspoken with criticism—visitors should not be over-critical. But when Mr. Simpson points out that any form of segregation by ability is looked upon as undemocratic in many high schools, that arithmetic is taught and regarded as completed at an early age-level, and that algebra need be studied only for one year, it is clear that the high school teacher of chemistry has an exceedingly arduous task. Nor can it be anything but arduous for the naturally gifted pupil to make good progress.

How are the great technological standards of US industry and research to be upheld by this 'flow-line' of basic chemical education? We are worried about our own future supply of well-trained chemists and other scientists, but only in quantity are we unable to make favourable comparison. The Americans might well reply that they have so far managed to maintain their technological standards and can hope to continue doing so, but this is the sort of reply that sounds better verbally than factually. Industry's demands are rising sharply, and the present level of US chemistry teaching has yet to be put to the test. Surely in the past, in pre-war years, high school chemistry teaching was better than it now seems to be?

In the high schools the average time allotted per week to chemistry is under four hours. Text-books are 'in the main extremely verbose' and are associated with 'workbooks' which provide exercises of a spoon-feeding nature, requiring the insertion of missing words or sentences in statements or insertions to balance equations, etc. A short-cut route to both teaching and learning chemistry would seem to have been mothered by the necessity of circumstance. However true it may be that from all this there emerge many people with a smattering of chemical acquaintance, the 18-year-old senior who leaves high school with a soundly established knoweldge of chemistry must be rare indeed.

This means, of course, that practically the entire chemistry teaching load is flung upon the universities. 'Most of our sixth form work is done there in the first two years at a State university.' To some extent, of course, we are being driven toward much the same position here as

a result of the shortage of good chemistry teachers in the schools: our universities increasingly find that 'freshers' arrive with less of their basic chemical education already acquired. The American university course for chemistry starts at the beginning, because many freshers have not taken chemistry at all in their school education, yet choose it because at the universities they must take one science. The rate of teaching (and presumably also of learning) is rapid because it can be geared to a high age-level. But can this approach to chemistry be accepted today when almost suddenly it has become such a vast and far-reaching subject? It is not perhaps our right or our business to ask the question; nevertheless, there are those here who hold up the American system of education as an example, and we have been tending to move towards the American routine.

Yet in the same issue as the second part of Mr. Simpson's report appears in, Professor T. S. Wheeler contributes a leading article on the theme 'Chemistry is Long to Learn'. With 'the torrent of new knowledge' teachers 'are bewildered and chemistry courses are overloaded'. Pauling is quoted for the opinion that the contemporary student of chemistry must not only know most of the basic subjects as taught 20 or more years ago, but now must add to this mathematics, physics with atomic physics, colloid chemistry, instrumental analysis, structural chemistry, and statistical mechanics. How can all this chemistry be taught during the normal university course? Must it not mean in the end that the length of training for graduation in chemistry is increased to that required for qualification in medicine? Alternatively, specialisation in some modern branch of chemistry must begin at an early stage and the graduate, though skilled for some special function in industry or research, will have a dangerously limited knowledge of other chemical branches. The impact of atomic fission has so far been small in its demand for scientific manpower and it has been satisfied to some extent by chemists and physicists trained in easier times. If it is true that we are within estimable sight of atomic energy on a large scale, and if, as was recently said in parliamentary debate, the use of radio-isotopes must be widely increased in industry, how will present systems of education and training, here or in America, meet the demand for scientific manpower? Progress may be forced to make a very gradual development, and it is a likely reaction that education based upon early specialisation will be urgently demanded.

A remote commentator on some other planet would probably regard these problems with an amusement not wholly callous or illogical. We are living in a time when the potentialities of science have expanded faster than our human capacity to make use of them; and simultaneously we devote much of our youth and energy and resources to armaments and defence preparation. The pint pot cannot hold a quart, yet we are driven to pursue the unattainable for fear that our competitors, either industrially at home or militarily abroad, make better accommodation than we succeed in making. There is no breathing-space for considered re-thinking. If academic authorities on the subject of teaching seem to have remained calm and placid, this gives no assurance that they are not merely living in the past—indeed, as Professor Wheeler points out, there is no agreement on the content of courses in chemistry, nor any uniformity of opinion about the ancillary subjects that are now necessary.

One single point seems to stand out with inescapable clarity—the teaching of chemistry must start in the schools and it must be as thoroughly conducted as it was formerly. Here school education in all the sciences and especially in chemistry is declining; in the United States, except in private schools, it has never apparently been looked upon as a particularly important school subject. Can this be squared in either country with the obvious demands of the future? Can we expect to maintain the present rate of expansion of living standards, with more new synthetic materials and fibres, more power at lower costs, more automatic mechanisation in factories, more life-prolonging drugs, and all the twentieth century rest, if the supply of future scientists and technicians is restricted at its source?

Notes & Comments

Chelated Iron

WE have referred before to the use of chelated iron compounds in plant nutrition (see THE CHEMICAL AGE, 1955, **72,** 265) and the possibility of other cationic nutrients being supplied in similar forms. A remarkable development in the iron story was the realisation that the total complex of an iron-EDTA combination could be translocated through the plant, the iron remaining tightly held until reaching sites of utilisation, where apparently plant processes could extract it from the grasp of the chelating radical. This enables iron deficiency to be remedied not only when soil conditions rapidly turn available iron into non-available iron but when metabolic conditions within the plant also tend to reduce availability.

Photochemical Decomposition?

A NEW contribution to *Nature* (1955, **175,** 347) from Long Ashton carries this intricate story further forward. It had been noticed that analyses of iron chelate solutions were inconsistent when repeated after the samples had been left standing in light. Iron chelates—not only the EDTA di-sodium compound but two others also—are photosensitive, the ferric ion being reduced to the ferrous ion; subsequent oxidation reverses this reduction but there is a production of hydroxyl ions, which accumulates and precipitates ferric hydroxide. Apart from the fact that this interferes with quantitative analysis in plant nutritional research, it may well shed light upon the means by which the plant extracts iron from the highly stable ferric chelates. Photochemical decomposition to the much less stable ferrous compound within the plant foliage seems a most plausible explanation. If it is correct, however, it is likely to diminish hopes that trace element problems may be overcome by EDTA or other chelates. It is already known from Long Ashton investigations that copper and nickel EDTA compounds are stable in light; if photosensitivity is a specific property of the ferric chelates, then this method of plant nutrition will be specific to iron as a plant nutrient.

Capital for Small Firms

SOME information about the Conditional Aid Revolving Fund for industry has been given in the latest issue of *The British Manufacturer*. This fund, backed with £700,000, started to operate in 1953 and it is reported now that loans amounting to about half the fund have been made or are being negotiated. The loans are short-term, low-interest loans, the basic idea being that as firms repay so other firms can have the benefit of the released capital. Shortly repayments from some of the earliest loans will begin to be made.

No Help for Chemicals

BRIEF details of some of the projects that have been supported are given. £25,000 was lent to an engineering firm making heavy metal equipment such as storage tanks; this loan was to be used to finance new machinery installations to speed up operations as much as five times. £20,000 was lent to a pipe-making firm to be spent upon automatic machinery to overcome a local labour shortage and upon an extension to its railway siding to reduce handling. £9,000 lent to a joinery manufacturer has supported the engagement of production consultants to develop new methods of working. Loans have been made to manufacturers of electronic equipment, silk and rayon fabrics, industrial clothing, medical and surgical instruments, hardware, and processed rabbit hair for hat-making. In the account referred to, there is no mention of a chemical manufacturer receiving Revolving Fund loan assistance, yet one might have supposed that many smaller firms had projects of precisely the kind that the scheme is intended to help. Perhaps the condition of early repayment is a disability so far as chemical projects are concerned. However, the further rise

in Bank Rate might well promote some rethinking on this subject. The Revolving Fund is administered by the Board of Trade, and full details are obtainable from the I.M.2 Division, Horse Guards Avenue, London, or from regional offices.

Building Up

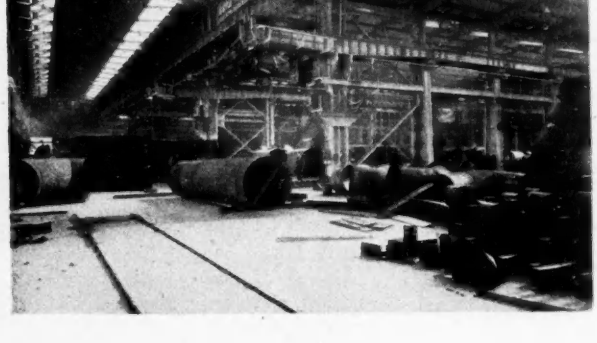
FERMENTATION products have the oddest effects, still unexplained, on the growth of animals—the use of antibiotics in farm feeding-stuffs is a widely-known example, and terramycin-supplemented diets have already reduced by 10 per cent the time it takes to get poultry and pigs to market. Now comes news of a so far unidentified growth factor, Vigofac, being produced by Pfizer's, which enhances the improvement brought about by terramycin. According to investigators at the Department of Animal Husbandry, University of Florida, 'the further addition of Vigofac at a level of 2 per cent resulted in a 26.2 per cent improvement in growth rate over controls, and 18.3 per cent over the groups supplemented with terramycin alone'. Since the patent situation for fermentation products in America is at the moment a highly complicated one, Pfizer's are understandably uncommunicative about the production of Vigofac, but it is certainly made by a fermentation process, and a little inspired guesswork suggests that the organisms involved are probably bacterial, and the product a relative of the B-complex. Opinions have been, and are, sharply divided about the value of B_{12} in animal nutrition, but the claims for this new product are impressive. Nevertheless, it has wisely been decided that exhaustive tests should be carried out in this country, with this country's animal rations, before Vigofac is freed to British farmers.

Facilities Offered in USA

FACILITIES for British companies who wish to develop or consolidate sales or manufacturing interests in the USA are offered by a New York firm, Oil and Chemical Products Inc., 295 Madison Avenue, New York 17. The company, well established in the petrolem, solvents, chemicals and pharmaceutical trades, has acquired a new site which is too large for their own immediate needs. They offer factory accommodation and storage space to British companies and with their existing plant are able to import, refine, pack and distribute in bulk any suitable chemical or petroleum product and supply the labour or material necessary.

They can also store, process, break down, import or export any commodity in bulk under conditions completely under the British company's control. A pilot plant could be erected on the site, which is also suitable as an embryo warehousing distribution or assembly centre.

Inquiries in this country are being dealt with by Rumex Oil Products Ltd., 155 Fenchurch Street, London, E.C.3.



One corner of the recently extended fabricating shop of the Power-Gas Corporation Ltd. at Stockton-on-Tees. This shop, with the new heavy machine bay, adds nearly 248,000 sq. ft. of floor area and completes the second step of development on the 100-acre site acquired in 1951 for extension

Seventh Technical Exhibition

OCCA Cover More Ground Than Ever

THE OCCA Exhibition provides a focus for the technical display of recent advances in materials, equipment and technology by suppliers to the industries covered by the Oil & Colour Chemists' Association, and the opportunity for their direct discussion between technical representatives. It is organised by the London Section of the Association and is held this year again in the Royal Horticultural Society's Old Hall, Vincent Square, London S.W.1, from 15 to 17 March. The exhibition will be opened at 3 p.m. on 15 March and will remain open until 8.30 p.m. On the other two days it will be open from 11 a.m. to 7 p.m.

The Exhibition Luncheon will be held at 12.45 p.m. on 15 March at the Criterion Restaurant. Sir Wavell Wakefield, MP, a vice-president and former chairman of the Parliamentary & Scientific Committee, has accepted an invitation and will reply to the address of welcome by the chairman of the London Section, Mr. R. F. G. Holness. At 3 p.m. Sir Wavell will perform the opening ceremony at the Exhibition.

There will be 62 stands this year, compared with 43 at the 1954 exhibition. All will be accommodated on one floor.

Aero Research Ltd. (Duxford, Cambridge) will be exhibiting some of their range of Araldite epoxy resins, 985E, 961A and the new 6000 series in particular. The latter has been introduced to provide a range of basic epoxy resins for the use of paint manufacturers who may wish to formulate their own finishes; resins of this series are capable of modification to produce a range of air-drying, cold-catalysed and stoving finishes.

The display of **Albright & Wilson Ltd.** (49 Park Lane W.1) will include acid butyl phosphate, an effective catalyst for lowering stoving temperatures of urea-formaldehyde and phenol-formaldehyde resins; triphenyl phosphite, to improve the colour of alkyl resins and prevent the precipitation of calcium phthalate; ethylaniline phosphate to prevent attack on tinned iron containers; and tributyl phosphate, to inhibit foam formation.

A feature of the stand of **Bakelite Ltd.** (12-18 Grosvenor Gardens S.W.1) will be made up of recent developments in the field of phenolic baking coatings. Until recently their usefulness has been restricted by their rather poor resistance to alkalis, but by condensing a polyamine into the phenolic resin in molecular proportions and then curing by heat a structure results which has excellent resistance to both alkalis and concentrated acids. Where it is impossible to employ baking coatings, finishes based on 100 per cent phenolic resins dispersed in drying oils may be used to obtain a high degree of acid and alkali-resistance on such materials as timber. Recent work has also resulted in the production of flexible coatings without loss of resistance.

A. Boake, Roberts & Co. Ltd. (100 Carpenters Road, E.15) will be showing three main groups of products: *p-tert.*butyl phenol, particularly suitable for oil-soluble resins; alkyl and aryl borates, for heat exchange fluids, keying agents for metal lacquers, welding fluids for silver alloys, hydrolysable solvents, etc.; and a range of plasticisers and stabilisers.

The exhibit of **BIP Chemicals Ltd.** (1 Argyll Street, W.1) will feature a semi-micro scale apparatus which is used to demonstrate a number of major steps in the analysis of alkyl resins, including hydrolysis and separation of the constituents into classes and their identification. The range of Beetle amino and alkyd resins will be exhibited, and attention drawn to their suitability in certain fields of application.

Main display of **British Industrial Solvents** (Devonshire House, Mayfair Place, W.1) will relate to new ester plasticisers in the Bisoflex range, and to Bisol acetoarylidides. Bisoflex 102 is essentially triethylene glycol dicaprylate and is of interest as a plasticiser for butadiene-acrylonitrile copolymers, in PVC compositions, and with polystyrene; Bisoflex 102A, which is based on mixed fatty acids rather than on relatively pure caprylic acid, has a slightly inferior low temperature performance to that of 102, but should prove economically attractive; and Bisoflex 103, which has a low-temperature performance between those of dioctyl phthalate and sebacate, should prove very satisfactory for hydrocarbon polymers. The acetoarylidides provide a range of intermediates for the pro-

duction of high-quality organic pigments such as the Hansa yellows.

PVA provides the main theme for the **British Oxygen Co.** (Chemicals Division, Chester-le-Street, Durham), together with melamine. This year's exhibit by **British Resin Products Ltd.** (Devonshire House, W.1) includes a new class of epoxy resins specifically developed for surface coatings. In the insulating varnish field, a xylenol-formaldehyde resin, R.7361, will be particularly featured.

Principal feature of the stand of **British Titan Products Co. Ltd.** (Coppergate, York) will be exposure testing: the wide range of climatic conditions under which the pigments are tested will be illustrated. The exhibit of **Croda Ltd.** (Snaith, Goole, Yorks) will demonstrate the possibilities of the Cithrols, non-ionic surface-active agents employed as latex emulsion stabilisers; lanolin, which is being incorporated in water paints; and a new extra-pale quality of pentaerythritol ester gum.

Dunlop Special Products Ltd. (136-142 Victoria Street, S.W.1) will be showing the Polimul range of polyvinyl acetate emulsions as a basis for the compounding of emulsion paints. The display will demonstrate the results obtained from a study of the influence of pigments and conditioning agents on viscosity; the influence of these factors on levelling characteristics; and on hiding power. Photographs will illustrate recent findings of the electron microscope in the examination of the structure of paint films.

The Geigy Co. Ltd. will display new developments and additions to their range of organic pigments; new benzidine colours for printing inks; Irgaset colours for flamboyant finishes; sebacic esters for plasticisers, etc. **Hercules Powder Co. Ltd.** (140 Park Lane, W.1) will focus attention on the applications of their products in the production of printing and coating compositions for the packaging industry designed to give satisfactory results with accelerated production methods.

Hickson & Welch Ltd. (Ings Lane, Castleford, Yorks) are to make an attempt to illustrate the effect of differences in visible form in the case of many of the intermediates manufactured by the company: diazo components such as *m*-nitro-*p*-toluidine, 4-nitro-*o*-toluidine, 2:3-dinitroaniline, 2:5-dichloraniline, etc.; and coupling components, including the various acetoacetarylides and 2:3-hydroxy-naphthoic arylides derived from *o*-toluidine, *p*-toluidine, *p*-chloroaniline, *m*-4-xylidine, etc.

The three main sections of the display of **Honeywill & Stein Ltd.** (Devonshire House, W.1) will be concerned with the latest developments in the use of the polyhydric alcohols sorbitol and mannitol; the applications of Atlas surface-active agents, such as the well-known Span and Tween emulsifiers; and Copagel A high-grade carboxymethyl cellulose.

The theme of the stand of **Howards of Ilford Ltd.** (Ilford, Essex) will this year be 'Improved surface coatings by the use of cyclic chemicals.' Notable among the exhibits will be the cyclic ketones of high solvent power, cyclic alcohols for flow properties, cyclic esters for low volatility plasticisers, and cyclic resin MS2, which has marked light-fastness and chemical resistance. A new chemical on offer for the first time in this country is tetramethylol cyclohexanol, developed particularly for the manufacture of rosin esters, modified drying oils, and alkyds.

I.C.I. Ltd. (Millbank, S.W.1) are to present products from the Dyestuffs, Nobel and Billingham divisions: new additions to the range of pigments and new synthetic resin developments; nitrocellulose, pentaerythritol resins, silicones, Phoryl resins and Phorosol additives; and solvents, resin-forming materials, plasticiser intermediates, antioxidants, fungicides and humectants.

The exhibit of **Johnson, Matthey & Co. Ltd.** (Hatton Garden, E.C.1) will lay emphasis primarily upon one of the most important properties of cadmium sulphide and sulpho-selenide pigments, their excellent resistance to fading through exposure to light. In addition, visitors will be able to see and assess the behaviour of cadmium pigments in severe conditions.

Midland Silicones Ltd. (19 Upper Brook Street, W.1) will show how silicones can be of increasing use to the paint industry, and the performance of paints based on newly developed silicone-alkyd resins will be demonstrated. These resins have been found to combine a high proportion of the heat stability and water-repellency of unmodified silicone resins with the better adhesion, faster cure, and superior film properties of the alkyd resins. Air-drying silicone-alkyd resins show considerable promise for finishes with better resistance to weathering.

Monsanto Chemicals Ltd. (8 Waterloo Place, S.W.1) will illustrate the latest developments in the use of Lustrex polystyrene dispersions in the manufacture of emulsion paints, the protective colloid Lustrex X820 which was first featured at last year's exhibition, and the range of Aroclor resins.

Main feature of the stand of **Petrochemicals Ltd.** (170 Piccadilly, W.1) will be the use of Catarex resins, grades 1, 2 and 3. These are pale-coloured, neutral hydrocarbon resins with good light stability. They are compatible with many natural and synthetic film-forming materials and are completely soluble in aromatic solvents, white spirit, esters, ketones and stand oils, and insoluble in ethanol, isopropanol and butanol.

Epikote resins will be an important part of the display of **Shell Chemicals Ltd.** (105-109 Strand, W.C.2). A new chemical which has many interesting applications in alkyds and Epikote esters is *p-tert.*-butyl benzoic acid. Replacement of part of the fatty acid in non-drying alkyds used with amino resins in stove coatings results in harder films with better colour retention and resistance to detergents. Alkyds modified in this way require less amino resin to give films of equivalent hardness.

The exhibit of **Vinyl Products Ltd.** (Butter Hill, Carshalton, Surrey) will follow the precedent of previous years in featuring some of the investigations undertaken in the company's technical service laboratories. As the use of PVA for interior and exterior finishes is now well established, emphasis this year is placed on some of the more novel applications of emulsion paints, such as emulsion-based gloss paints and wood primers.

Brochures of the exhibition have been circulated to all members of the Association at home and abroad, to firms connected with the paint and printing ink trades throughout the UK and, as far as possible, Western Europe, and to technical colleges and universities. Non-members wishing to obtain copies should apply to the General Secretary, Mr. R. H. Hamblin, OCCA, Memorial Hall, Farringdon Street, London E.C.4.

Films

Structure & Adhesion

AS already announced (THE CHEMICAL AGE, 1955, **72**, 237), the 1955 Conference of the Oil & Colour Chemists' Association will be held at Llandudno from 7 to 11 June. Those attending the conference will assemble on the evening of 7 June and there will be three technical sessions on 8, 9 and 10 June. The following is the provisional list of lectures arranged for the conference:—

Wednesday, 8 *June*: Dr. J. H. Schulman, O.B.E. (Dept. of Colloid Science, Cambridge) 'The adhesion of amphipathic molecules on to solid surfaces in general'; Dr. S. H. Bell (Paint Research Station), 'The structure of paint films: a general chemical and physical survey'; and Dr. N. A. Brunt (Verf-Instituut) 'Elasticity of some types of varnish films as a function of time and temperature.'

Thursday, 9 *June*: Dr. A. Jobling (Dept. of Colloid Science, Cambridge) 'Some recent developments in the mechanical testing of materials'; J. H. W. Turner (British Resin Products Ltd.), 'Composition/property relations in high polymer emulsions'; Dr. T. F. Bradley (Shell Development Co., California), 'Physical characteristics of epoxide resin films'; and A. G. Day (Electrical Research Association), 'Water sorption in polystyrene, cellulose triacetate and polyvinyl chloride below saturation vapour pressure.'

Friday, 10 *June*: P. O. Blackmore (Inter-Chemical Corporation), 'A review of film formation studies in the USA'; P. D. Wright (British Industrial Solvents), 'The evaporation of binary and ternary solvent mixtures and their release from lacquer and resin films'; and D. M. James (International Paints), 'Experiments on paint adhesion under moist conditions.'

Hungary Plans Plastic Self-Sufficiency

Recent statements in the Hungarian press indicate that production of a number of basic plastic materials is to begin. These include methyl methacrylate, which will be produced during 1955, and phenol-formaldehyde moulding powders. In 1956 home production of PVC will start, as well as the production of nylon 66 and 6. Experiments have also begun in the manufacture of PVC body work for light cars, nylon bearings and gear-wheels, and insulating material for electrical goods intended for tropical countries.

Theory & Practice

Recent Papers Presented to Chemical Engineers

A MEETING of the North-Western Branch of the Institution of Chemical Engineers was held at Chester on 9 February when a paper on 'Columns with Sidestreams in Multi-Component Distillation' was presented by Dr. N. L. Franklin and R. W. Goulcher.

The authors first defined a separation diagram for a multicomponent separation process, and showed that the characteristics of the diagram are similar for all normal mixtures of a given number of components. The diagram is represented in the space in which the mixture composition is represented—for example, in the composition plane for ternary systems—and the effect of a change in product composition or in reflux ratio is to change the location of the separation diagram in this space. The nature of the change follows established rules and can be predicted qualitatively without calculation.

These diagrams represent the behaviour of a separation with one feed and two products, e.g., when the reflux ratio in a part of a column or cascade is artificially varied or when a sidestream is withdrawn from the column. The use of auxiliary reflux in the appropriate sections of a column will permit the column to operate even though many plates or stages operate at a reflux ratio below the minimum value for a simple column. In the separation of a binary mixture the appropriate sections are on each side of the feed plate, but the contrary often is true for mixtures of more than two components. So the choice of the appropriate sections was explained in terms of the separation diagram.

Sidestream Specification

The discussion of columns from which sidestreams are withdrawn was largely restricted to mixtures of three components. The specification of the sidestream was considered in relation to the purpose for which it is to be withdrawn from the column and three types of specification were distinguished and considered separately. For each the separation diagrams were presented and were used to predict the effect of withdrawing the sidestream upon the minimum and partial reflux conditions. Methods of determining the minimum reflux ratio were given. Techniques of carrying out calculations under partial reflux conditions, which avoid or minimise trial and error methods, were presented and the simplest design method for each condition was described in detail.

The possibility of producing three relatively pure products from a ternary mixture in a single column or cascade was investigated. This will often require very high reflux ratios, but such ratios are required only over a short section of the column. The possibility of using auxiliary reflux, provided by a heat pump, over this section was considered and it is suggested that, under favourable conditions, the separation of a ternary mixture in a single column is a practical possibility.

Particle Size Analysis

Another meeting of the North-Western Branch was held at Manchester on 18 February when J. K. Donoghue and W. Bostock presented a paper on 'A New Technique for Particle Size Analysis by Centrifugal Sedimentation.'

Methods of analyses of particle size by gravitational sedimentation are either incremental, when the concentration of powder at a point below the surface of a suspension of the powder in a liquid is measured, or cumulative, when the concentration of the powder in a known volume of dispersion down to a particular depth is obtained. When the powder contains a substantial proportion of material under 5μ centrifugal methods are used and Mr. Donoghue described his new technique for routine measurements on such powders.

In the usual centrifugal experiments the height of the liquid suspension is varied and the time of sedimentation is constant; the suspension must be uniform in composition and sector-shaped vessels must be used as particles move radially outwards under centrifugal force. This centrifugal force on a particle is balanced at any moment by the Stokes drag to give quantitative expressions for the total weight fraction deposited.

In this work the outer radius was varied, the height of the suspension and the time

were kept constant; for these conditions an annulus with plane surfaces at the top and bottom is the most suitable vessel because in it the tangential acceleration of the particles during the acceleration of the centrifuge from rest becomes unimportant.

The vertical rotor of the centrifuge was designed as two parts. The lower one is mounted directly on the motor-shaft and has a centre section which defines the inner radius of the suspension; the upper part has an inner surface of six steps and it fits on to the lower part. Thus the suspension, which is introduced through a hole in the top, is contained in a space consisting of a number of annular rings one above the other and communicating with each other; the outer radii increase from top to bottom and the inner radius is constant.

The weight fractions deposited on the annuli must be removed without loss, therefore the supernatant liquid is removed by a water-pump while the centrifuge is still running. The deposit is firmly packed by running the centrifuge at a speed higher than normal, and is removed on detachable metal strips, two strips for each step placed diametrically opposite one another being removed, dried and weighed. The movement of particles under gravity is small and negligible if the particles are so small that normal settlement during the starting period can be neglected.

The weight fraction on each step is plotted against the radius of the step to give a calculation of the size distribution. Two experiments of differing times are necessary if the sample has a narrow range of particle size. Details of an experiment on silica dust were given.

Biggest British Electrical Exhibition

More Firms will Take Part

THE largest full-scale British electrical exhibition since 1911 will be opened at Earls Court at noon on 15 March by Lord Citrine, chairman of the British Electricity Authority. This year there will be over 240 exhibitors, compared with 192 last year, and a number of applications for stands have had to be refused.

The exhibition is sponsored by the Association of Supervising Electrical Engineers. Over 331,000 invitations have been sent out to the trade, including 31,000 personal invitations to every electrical manufacturer, supplier and dealer, every United Kingdom Trade Commissioner and every electrical journal in the world.

To provide a permanent record of the exhibition a film is being made of it, showing the exhibits and the opening ceremony. As Lord Citrine declares the exhibition open, he will face the main aisle where he will see, suspended from the roof 40 ft. from the floor, a huge 30 ft. model of the exhibition's feature, "The Electric Motor." At the far end of the hall will be a large scenic backcloth of the latest design of Britain's atomic power station working in an animated form by use of fluorescent lighting controlled by electronic mercury vapour valves and giving movement slowly instead of the usual intermittent control.

Among the exhibitors will be firms who specialise in making accessories for the industry. Bakelite Ltd., for example, will show a wide range of products, including the new high-pressure glass laminates which the company produces in three grades based on melamine, silicone and phenolic resins to give a combination of improved electrical properties, heat resistance and strength. Recently developed Bakelite moulding materials include alkyds with excellent anti-tracking characteristics and stability in conditions of both wet and dry heat, and rubber-modified phenolic materials for the production of particularly strong components. A further display will be composed of Warerite decorative panels, supplied by Warerite Ltd., an associated company, which are being increasingly adopted for the construction of control boards and into which diagrammatic lay-outs can be incorporated in such a way that they are permanently protected from damage.

Evershed & Vignoles Ltd. will be exhibiting a wide range of their instruments and other products. These include testing instruments, indicating and recording instruments and fractional horsepower motors.

At the stand of Ferranti Ltd. will be shown a large number of transformer, meter and instrument products as well as domestic appliances, including the new fridge-heater which will be displayed in the form of a demonstration unit. Other Ferranti products on display will also be demonstrated.

Seven general purpose industrial motors and a variety developed specially for lift and marine applications will be displayed by The General Electric Co. Ltd. Also on show will be the new fractional horsepower motors which are mechanically interchangeable with other makes complying with BS. 2048:1953.

Londex Ltd., who believe they are the only relay manufacturers exhibiting, will show several new relays, including a midget relay with a moulded base, insulators and screw terminals, a calibrated sensitive relay, sealed co-axial relays and starter relays with auxiliary contacts. New among the range of Londex process and interval timers is the type RFT which has been introduced to meet a demand from equipment manufacturers for a compact timing unit for flush mounting on control panels which will in appearance favourably match other components.

Flameproof Motors

The emphasis of Newman Industries Ltd. stand will be on their range of flameproof motors. The aim is to show in detail how the firm have tackled the job of designing a wide range of flameproof motors that meet all the requirements of the Buxton and CSA authorities. The chief exhibit will be a comprehensive selection from the Newman flameproof motor range, including both naturally and fan-cooled models, and a special display showing one of the larger fan-cooled flameproof motors quarter-sectioned and arranged to run. Although the emphasis will be on the flameproof models, other exhibits from the Newman range will also be on show.

A large number of new products, including Simplex Regent switchgear, busbar chambers and accessories, Regent panels, Regent distribution boards, we'l glass lighting fittings, accessories and flameproof equipment, will be displayed on Simplex Electric Co. Ltd.'s stand.

Sunvic Controls Ltd. will be exhibiting their range of domestic products, including a new water heater thermostat designed to meet the modern demand for simpler immersion. There will also be featured a range of typical industrial controls, such as hot-wire vacuum switches, energy regulators and thermostats.

Henry Wiggin & Company Limited are showing at their stand a new grade of nickel-chromium alloy—Brightray 'H'—for high-temperature furnace resistors. This alloy is a modified 80/20 nickel-chromium alloy intended for use as a heating element in electric resistance furnaces where the element operating temperature exceeds that for which Brightray 'S' is normally suitable. The new grade is intended for elements operating in the temperature range 1,100/1,250° C. Brightray 'H' has been developed as a result of extensive work carried out in the research laboratories of The Mond Nickel Company Ltd., and is now in production by Henry Wiggin & Company in the form of rod, wire and strip.

4,000 Petrol Samples

ANTIKNOCK values of regular- and premium-price motor fuels sold at United States filling stations last summer were the highest in history, according to the US Bureau of Mines' semiannual survey report.

Giving results of the latest in a series of surveys made by the Bureau in cooperation with the American Petroleum Institute, the report shows that regular- and premium-price motor fuels sold during the summer of 1954 had average research method octane ratings of 85.5 and 92.9 respectively. The previous high ratings, established during the winter of 1953-54, were 84.7 for regular-price fuels and 91.5 for premium-price fuels.

During this most recent survey, 3,924 samples representing the products of 116 large and small companies were collected from filling stations throughout the country and analysed in company laboratories. In addition to octane ratings, the samples were tested for gravity, corrosion, sulphur content, gum, tetraethyl lead, Reid vapour pressure, and distillation temperatures.

The report contains charts indicating trends of selected properties of motor fuels over a number of years, and a map showing current sampling locations and districts.

Pulp & Paper from Agricultural Residue

by D. N. MITRA, B.Ch.E.

(Chief Works & Development Chemist, Millspaugh, Limited)

DURING recent years, as a result of the vast increase in the consumption of paper and consequent diminution of the world's pulp wood resources, considerable attention has been given to the search for new paper-making fibres, especially in countries with inadequate pulp wood supplies. The world's resources of soft woods are almost entirely concentrated in the Northern Hemisphere—North America, the Soviet Union and Scandinavia—and countries which have no natural supplies of soft wood and are cut off from such sources elsewhere in the world by reason of monetary or ideological barriers are increasingly turning to other raw material sources.

These materials which include agricultural residues—wheat straw, rye straw, rice straw, sugar cane bagasse, etc.—mature even faster than the tropical woods and they are abundant in areas which do not have adequate forest resources of any kind. It has been shown conclusively in these countries that from a technical standpoint the use of these materials for production of pulp gives excellent results, and a large number of plants have gone into successful operation in various parts of the world following considerable developments in straw and bagasse pulping.

Cornstalks & Banana Stems

In addition to cereal straw and bagasse there are other agricultural waste materials such as linseed straw used in America and Canada for the manufacture of cigarette papers, cornstalks used to some extent in America largely for board making, banana stem fibre and citronella grass used in Formosa, hemp and jute waste for strong papers, cotton stalks, abaca grass, sar grass, etc. Also there are various grasses used in considerable quantities for paper-making but not classified as agricultural residues. Esparto, used so much in this country, and sabai grass in India are examples.

Straw is an agricultural by-product and therefore potentially very cheap. Most of the cereal straws are useful for paper pulp and from the paper-making point of view they could be listed in the following order of preference: rye, wheat, rice, oats and barley. The essential material for paper manufacture is, of course, cellulose and this exists in varying proportions in all the agricultural residues. Average figures for cellulose content of the various cereal straws are as follows: rye 46-54 per cent, wheat 45-52 per cent, oats, barley and rice about 40-48 per cent. Thus, from the paper-maker's point of view, rye and wheat straws are preferable to others in that they give a higher yield of pulp and better strength characteristics. In commercial practice a good yield from wheat straw lies between 42 and 47 per cent.

Advantages of Rice Straw

Rice straw possesses the advantage of having the highest fibre length to width ratio and this feature imparts to it a very good sheet-forming characteristic. The ash content of these straws varies according to the nature of the soil in which they are grown, often ranging from 3 to 14 per cent, of which a high proportion is silica. The amount of straw ash which is transferred to the finished paper depends largely on the pulping process, some chemical treatments removing more ash than others.

Moisture in straw is an important factor and it is absolutely essential to store the straw properly prior to pulping. The moisture content, as collected from the land, is normally between 10 and 15 per cent and if it exceeds this figure it is customary to make a deduction in the payment for straw. If, however, it exceeds 20-25 per cent, which may result from storing the straw uncovered, a preliminary drying of the straw at the pulp mill is necessary, especially if it has to be cut and conveyed by air.

Straw is a heterogeneous raw material, both chemically and physically, the plant comprising internodes, leaves, nodes, heads, chaff, etc. The internodes and leaves comprise about 70-80 per cent of the whole plant, while the heads, nodes and dust occur in relatively decreasing proportions.

Although the removal of some of the harder parts is probably desirable before pulping with suitable machinery, it is not economically feasible as the quantity is fairly great. However, it is the usual practice in straw pulping today, whether by continuous or batch process, to cut the straw to facilitate the removal of dust, grain and dirt and make it easy to convey and improve the pulping characteristics.

Characteristics of Bagasse

Bagasse is the waste fibrous product left after the sugar juices have been crushed out of the sugar-cane. It emerges from the crushing plant with about 45 per cent moisture and is usually burnt in the boilers to raise power and process steam for the mill's requirements. Even so, all the bagasse cannot be used in this way, and the disposal of the excess has often been quite an embarrassment to the mills in view of its immense quantity. In recent years the conversion to pulp, paper and fibre boards has opened up possible outlets for this material and several of the world's leading sugar mills have installed a pulp mill as a profitable side line.

Dry bagasse has a higher calorific value than wet bagasse and it has lately been the practice among sugar mills to burn their bagasse dry instead of wet in order to increase the efficiency of their boilers and at the same time liberate a large excess of bagasse for pulping purposes.

Wet bagasse is bulky and is somewhat liable to spontaneous ignition if stacked loose. For this reason, it is absolutely essential to bale the bagasse as it comes from the crushers. A common baling machine compresses the wet bagasse into bales of approximately 12 in. by 12 in. by 20 in. which are then stacked under cover and allowed to dry to an air-dry state, thus eliminating any danger of spontaneous combustion.

One of the main undesirable constituents in bagasse is the pith, which is contained to the extent of about 25-30 per cent. If left in the pulp, it renders it more difficult to bleach, decreases the strength properties, decreases the rate of drainage on the paper machine and makes the product unsuitable for conversion into high grade paper. In fact, the key to successful use of bagasse for production of pulp is an efficient and effective commercial means of separating the pith from the fibre, followed by some economical use of the pith.

Nowadays the separation of pith is done either by the wet method before or after baling or by the dry method after baling. In the former, the bagasse is vigorously agitated in water and then screened. In the latter, the bales are put in a bale-opener and disintegrator and the dry pith separated as a dust by screening. The dry pith can either be burnt as a fuel or mixed with molasses for use as a cattle fodder.

Straw and bagasse pulps are rather similar so far as their paper-making properties are concerned. The fibre dimensions are much smaller than those of soft woods used largely for wood pulp manufacture, but are finer and a little shorter than hardwood fibres. An average dimension of straw and bagasse fibre is 1 to 1.5 mm. length, in contrast to pine or spruce fibres which are 3 to 4 mm. long. This relative shortness of the fibres is one of the main reasons why such pulps can be advantageously used in making fine papers with good appearance and strength, which can only be obtained with wood pulp by considerable beating or shortening of the fibres.

Some of the chief characteristics of straw and bagasse pulps are good strength, moderate colour, rigidity and a tendency to hardness. They are pre-eminent in imparting good appearance and bring a marked economy in beating time. Straw pulp can be successfully beaten with wood pulp, thus reducing the amount of beating required for the wood and at the same time producing a firm sheet suitable for printing and writing papers.

Versatile in Application

Straw and bagasse pulps are being used in different parts of the world in almost every type of paper. These pulps are versatile in application but not so versatile as the long fibred wood pulps. Unlike wood pulp, which is naturally rather soft and can make a firm sheet by suitable beating, straw or bagasse pulp is naturally firm and cannot be made soft. For this reason it is unsuited to the so-called feather-weight printings, which are characterised by exceptional bulkiness, achieved mainly by the use of esparto.

Bleached straw or bagasse pulp is most suited to papers in which it can be successfully employed in a mixture with wood

pulp without any loss of strength or quality. The strength of straw or bagasse pulps is good when compared with writing or printing papers made from well-beaten wood pulp, in which the fibre length has been reduced. While wood fibres may be shortened, straw or bagasse fibres cannot impart the characteristics of long fibres, the most important of which is high tearing strength. Because of this, straw or bagasse pulps alone are unsuited to very strong wrapping papers or cement sacks, but can be widely used in such papers in admixture with long wood fibres, mainly to fortify the tearing strength.

Some of the other papers in which straw pulp has found extensive use are greaseproof and glassine, duplicator papers, tissues, and even diazo-sensitising papers for engineering prints.

In the fields where unbleached pulps are used, straw and bagasse pulps are also extremely important. They can be used in the manufacture of coarse papers such as wrappings, boards, and corrugated material. Straw pulp alone or mixed with low grade waste paper is the preferred material for these products. Imitation kraft containing strength properties not much different from that of pure kraft can be made with a mixed furnish of unbleached straw or bagasse (50-75 per cent) and kraft pulps beaten together. With careful processing bagasse can be made to produce a very pure pulp suitable for dissolving pulps in rayon manufacture.

No Competition With Newsprint

Although research work and pilot plant trials have shown that newsprint of satisfactory printing quality can be produced from it, it is unlikely that bagasse will form an industry producing newsprint in direct competition with newsprint made from wood pulp. Normal newsprint contains 80 to 85 per cent of pulp prepared from logs by mechanical grinding, with a yield approaching 90 to 95 per cent. Bagasse, on the other hand, must be pulped by the use of chemicals, thus putting up the cost of chemical treatment, and no method has yet been developed to produce bagasse chemical pulp in yields above 50 per cent. It may, however, be increasingly used for supplying local needs, such as in countries where there is difficulty in providing currency for newsprint imports or where freight charges on normal newsprint are unusually high.

There are various methods advocated for extracting cellulose, but only a few processes have successfully bridged the great gulf between the trial stage and successful full-scale production. Of all the processes which are in vogue for the pulping of straw or bagasse, only four are currently in commercial use—the soda, the sulphate, the mono-sulphite and the Celdecor-Pomilio processes.

The Four Processes

In the conventional soda process the straw or bagasse is cooked in rotary or stationary digestors with caustic soda alone under high temperature and pressure for 4 to 5 hours. The pulp is bleached in a one-stage bleaching process using hypochlorite with a resultant yield of about 40 per cent on the moisture-free weight of the material.

The conventional sulphate process uses liquor containing caustic soda and sodium sulphide, but cooking and processing conditions are otherwise similar to those of the soda process, somewhat higher yields and better physical characteristics being obtained. One of the most successful pulp mills in the world using this process is the Phoenix mill in Holland, which has been producing high quality bleached straw pulp since 1898.

The mono-sulphite process is the most commonly used in Italy, Germany and Holland at the present time for the production of bleached straw pulp. The straw or bagasse is usually cooked in rotary or stationary digestors with cooking liquor containing sodium sulphite and caustic soda or sodium carbonate under high temperature and pressure for 2 to 8 hours. The yield of bleached pulp is comparatively greater than that of the other chemical processes, ranging from 45 to 50 per cent, due mainly to the high ash content retained in the pulp.

The Celdecor-Pomilio process is one of the most widely used in the world today for the production of pulp from agricultural residues. This process was originally developed as the Pomilio process in Italy and has during the past several years been greatly modified and improved by Cellulose Development Corporation in England, who at present own the patent rights to it.

Apart from its being continuous, the main difference between this process and others lies in the relative amounts of cooking chemicals and cooking conditions employed

in the pulping process. As now used in a large number of full-scale plants in various parts of the world, this process gives an excellent quality, clean bleached pulp from straw, bagasse, esparto and other agricultural residues.

Slightly Varying Treatments

The process incorporates a preliminary cutting and cleaning of the straw to remove the dust from the short lengths of straw which next fall into a pre-soaking machine. With bagasse, the treatment is slightly different, the bales being first broken down in a disintegrator for the removal of pith and dust. In the soaking machine the straw or bagasse is saturated with dilute caustic soda and conveyed to the top of the digestion tower, during which the unabsorbed liquor drains back into the soaking tank.

Digestion of the caustic-soaked material takes place in a tall continuous tower, the material being steam-cooked as it travels by gravity down the tower, from the bottom of which it is extracted continuously. After passing through the tower, the black cooking liquor has to be washed out of the material and this is done by means of a rotary vacuum drum filter, on which fresh water sprays displace the liquor from the material by means of vacuum applied inside the drum. The cooked straw or semi-pulp after passing through a continuous refiner is now ready to be made into wrapping papers, boards, corrugated and other coarse papers.

For the production of high grade bleached pulp, the semi-pulp is subjected to further treatments to remove the last traces of impurities. The liquid content of the pulp is still further reduced by passing it through screw presses which form the pulp into a cake, which then goes into an opening machine to be broken up ready for the bleaching operation by the use of chlorine.

In this, the moist semi-pulp is allowed to pass by gravity through a series of long, narrow towers into which chlorine gas is admitted half-way from the bottom. Following this, the chlorinated pulp is taken from the bottom of these towers to the washers and then extracted with dilute caustic soda solution. From the caustic extraction stage, further washing and thickening follows on another vacuum filter, the pulp at this point being ready for the final stages of processing—screening, thickening and bleaching. Following the bleaching stage the pulp is finally washed on a vacuum filter and is ready to be sent to the paper mill for use in various grades of paper.

This process depends upon the electrolysis of salt to form caustic soda and gaseous chlorine, which are used in the same proportions as they are formed from the electrolytic plant. In view of the high state of development and the success of practical application of this process, it is believed that its use will be extended greatly in the future in locations where inexpensive sources of fibrous agricultural residues, salt and power exist.

A recent and interesting development in agricultural residue pulping has been in what is known as the Mechano-Chemical process, associated with the names of Dr. Lathrop and Dr. Aronovsky of the US Northern Regional Laboratory at Peoria, Illinois. This process incorporates a combined low pressure digestion and mechanical disintegration of straw or bagasse in hot caustic soda solution in a specially designed vessel known as a Hydrapulper and produces pulps suitable for corrugating media and also bleached pulps for fine papers.

The majority of straw and bagasse plants which have gone into successful operation during the last decade are using British equipment and the Celdecor-Pomilio pulping process.

Bleached Pulp Plant in India

The most interesting bagasse development since the war has been the start in India of a bleached pulp plant installed in the mill of Rohtas Industries Ltd. at Dalmianagar (Bihar). This plant, the first of its kind in the Commonwealth, began production in 1951 and has a rated capacity of 24 tons per day of high grade pulp.

In Brazil one of the largest sugar-producing companies, Refinadora Paulista SA, have recently completed the installation of a plant adjoining their sugar mill at Monte Alegre in Piracicaba, State of Sao Paulo. This plant, which has been running since 1954, has a capacity of 24 tons per day of bleached bagasse pulp for writing and printing papers. Another plant using bagasse as a raw material is being erected in Mexico and one is already in operation in South Africa.

On the straw side, developments have been equally rapid. In North Africa, in

1949, Cie Nord Africaine de Cellulose, Algeria's largest paper company, started operation of the world's first all-continuous pulp and paper mill from agricultural residues at Baba Ali, Algiers. This mill, which is particularly noted for producing fine papers without any wood or rag at all and for the fully continuous processing from raw material to finished paper, has a present pulping capacity of 35 tons per day, the raw material being entirely esparto grass and straw.

In France, in early 1951, Papeterie de la Seine, Nanterre, put into commission their straw semi-pulp plant which now operates under the name of Cellulose de la Seine. This unit pulps about 50 tons of straw a day for use in cardboards, corrugating and wrapping papers. A French company, Cellulose du Fin, has recently installed a 35 tons a day semi-pulp plant at Facture to produce wrapping paper and boards.

In Britain in 1945, a continuous straw semi-pulp plant was installed by the Bowater Paper Corporation at their mill in Sittingbourne to produce pulp for use in corrugated media. This mill also has a bleached straw pulp plant of 24 tons a day capacity alongside their semi-pulp unit.

One of the most important new straw pulp plants in Europe came into operation in Holland in 1942 under the name of NV Maatschappij Tot Strovedeling Sove. This mill, installed at Arnhem, has a present rated capacity of about 40 tons per day of high grade bleached pulp.

Analysis of Acid Casein

BRITISH Standard 1417, Methods for the sampling and chemical analysis of acid casein, first published in 1948, has now been revised to cater for improvements in technology which have taken place since then.

The tests specified indicate methods of ascertaining the general quality of acid casein. By providing uniform and closely specified tests this standard correlates the work of different analysts and provides a means of relating the analytical character of commercial casein with success or failure in use, or with methods of manufacture, thereby leading to the production of more uniform grades of casein applicable to various specific uses.

The standard covers the sampling and analysis of acid casein and provides for the preparation of the sample for tests, determination of coarse particles of foreign matter, size of particle, determination of moisture, ash, fat, free acidity, *p*H value, iron, nitrogen, rate of solution and *p*H of solution in borax.

Copies may be obtained from the British Standards Institution, Sales Branch, 2 Park Street, W.1, price 3s.

SA Factory Grows

SOUTH African metal industries have played an important part in the erection and equipment of the new chemical factory at Umbogintwini, where African Explosives & Chemical Industries Ltd. will produce chlorine and caustic soda. All sections of the new plant will be in use by the middle of this year and in full operation by Christmas. The factory is being developed to meet anticipated increases in the demand for these products and about £2,000,000 is invested in the expansion. Equipment includes special pressure vessels not previously made in South Africa.

It is said that this new factory will be the first in South Africa to manufacture PVC from basic raw materials. I.C.I. have lent African Explosives & Chemical Industries a team of nine specialists who are to work in the factory with the permanent staff during the early stages of operation.

Planned for the Purpose

INCREASE productivity through planned plant layout is the moral of *Planned for the Purpose*, a new film produced by the British Electrical Development Association. The film, aimed at interesting managements rather than the general public, illustrates the contribution that modern industrial engineering can make to productivity.

The most important aspects of industrial engineering are outlined, including the planning of new projects, plant siting, plant layout and building design. Examples of modern electrical applications, such as infrared drying and induction heating, are illustrated, and the film gives prominence to various types of lighting used in industry.

Copies (35 and 16 mm. sizes) are available on free loan from the British Electrical Development Association, 2 Savoy Hill, London W.C.2.

Enriched Isotopes

Conference on Production & Use

A CONFERENCE on the production and utilisation of electromagnetically enriched isotopes will be held at the Atomic Energy Research Establishment, Harwell, from 13 to 16 September inclusive. Several leading members of the team responsible for the work on stable isotopes at Oak Ridge, USA, are attending, while provisional acceptances have also been received from leaders of the separator groups in France, Holland and Denmark.

Although a detailed programme has not yet been prepared, sessions will be included on: design and operation of large mass separators; ion source and collector problems especially with high beam current; separation of radioactive materials; chemical aspects of the production work; preparation of isotopic targets; developments in stable isotopes mass-analysis; utilisation of electromagnetically enriched isotopes.

Applications of Stable Isotopes

Much of the meeting will be occupied with problems of the electromagnetic separator itself but contributions will also be welcomed on applications of stable isotopes, especially those of an unusual type. The emphasis here should be on the principles involved and not on the details of the great variety of techniques which users may employ. On the other hand the great volume of work on the application of the isotopes of the lighter elements, particularly of hydrogen, carbon, nitrogen and oxygen which are more economically enriched by other methods, is specifically excluded.

The meeting should provide an opportunity for bringing together people concerned with the production and use of stable isotopes and should stimulate further applications. The UK Atomic Energy Authority asks those wishing to attend to write immediately to Dr. M. L. Smith, AERE, Harwell, Didcot, Berks, indicating also whether they will make a written contribution. Abstracts of papers must be submitted before 30 April, and complete manuscripts before 30 June, so that preprints of the paper can be made available before the conference. Accommodation can be arranged locally and apart from the cost of this, there will be only a small charge to cover food and transport for the four days.

Copper Fluoroacetate

Preparation & Properties

A COMMUNICATION from M. A. Phillips, D.Sc., F.R.I.C., A.M.I.Chem.E. (Dr. M. A. Phillips & Partners, 14 Western Road, Romford) describes the preparation of copper fluoroacetate. By treatment of fluoroacetic acid in 30 per cent aqueous solution with 10 per cent excess of copper carbonate [basic $CuCO_3.Cu(OH)_2.H_2O$] at 90° C with stirring, and filtration from excess of copper carbonate, a deep blue solution of this very soluble copper salt is obtained.

Concentration to very low bulk or to dryness is necessary to obtain the salt and concentration must be at low temperatures to minimise decomposition. Vacuum concentration to dryness at about 40 mm. Hg gives a quantitative yield and the salt forms deep blue crystalline tablets very similar in appearance to copper acetate. The salt is efflorescent; as first formed, it appears to consist of a trihydrate $Cu(OOC.CF_3)_2.3H_2O$. Careful drying at 30° C in a vacuum oven gives a green powder which is the anhydrous salt $Cu(OOC.CF_3)_2$. The salt is insoluble in ordinary organic solvents.

Loss of weight is best estimated by vacuum drying at 30° C to constant weight; copper estimation was done by precipitation of copper hydroxide with caustic alkali followed by ignition. The loss of weight found was 18.9 per cent (calc. for $3H_2O$, 19.9 per cent); copper on the anhydrous salt was 57.7 per cent [calc. for $Cu(OOC.CF_3)_2$, 58.0 per cent].

The author is indebted to Associated Fumigators Ltd. for permission to publish this note.

Third Firm in Potash Hunt

INTERNATIONAL Minerals & Chemical Corp. of Carlsbad, New Mexico, is the third US company seeking to develop extensive potash beds in Saskatchewan.

The Saskatchewan Government has recently granted six potash withdrawal areas to International Minerals. The company applied for and was granted approximately 600,000 acres. In addition, Popular Oils Ltd., Calgary, was granted 100,000 withdrawal acres in the Saskatoon area.

Other US companies are Potash Co. of America and Duval Sulphur & Potash Co. (see THE CHEMICAL AGE, 1955, **72**, 221).

Arsenic in Food

Statutory Effect to Proposed Limits Recommended

THE Minister of Food, the Rt. Hon. D. Heathcoat Amory, MP, has approved for publication a revised report presented to the Food Standards Committee by their Metallic Contamination Sub-Committee recommending the introduction of limits for arsenic in foods. Earlier reports on this subject by the sub-committee were published in February 1950 and September 1951 (THE CHEMICAL AGE, 1950, **62**, 323; 1951, **65**, 396). Since then the sub-committee have reviewed the representations received from trade and other interests and the revised report replaces the earlier reports. The revised report recommends that statutory effect should be given to the limits now proposed and that any statutory limit prescribed should be subject to the periodical review.

Little Change From 1903

The sub-committee have proposed the limits which they consider can at present be readily attained under conditions of good commercial practice. They confirm the appropriateness of the general limits previously recommended, i.e., 0.1 ppm. arsenic for beverages ready-to-drink and 1 ppm. for other foods. These limits are substantially the same as those recommended by the Royal Commission on Arsenic in 1903.

On the other hand the sub-committee's original inquiries, and subsequent representations, have drawn attention to articles of food and drink to which these general limits could not at present be applied, principally concentrated foods and substances in the nature of food adjuncts which only enter into the diet in small quantities. The sub-committee are of the opinion that it should be possible in due course to reduce the limits proposed for certain specified foods. The foods and drinks which cannot be brought within the general limits, or which can be subjected to lower limits, and the limits recommended in each case, are given in the accompanying table.

So far as fresh or processed crustacea, shell or other sea-food in which arsenic may occur naturally in amounts higher than 1 ppm. are concerned, the sub-committee recommend that the sale of these foods containing arsenic in excess of 1 ppm. be permitted if it can be shown that the arsenic is natural to them.

The Food Standards Committee have adopted the report of their sub-committee but before taking any action on it the Minister of Food is willing to consider any further representations which interested parties may wish to make. They should be addressed to the Assistant Secretary, Food Standards and Hygiene Division, Ministry of Food, Great Westminster House, Horseferry Road, London S.W.1, and they should be lodged not later than 31 May. Copies of the report may be obtained from HM Stationery Office or from any bookseller (price 4d. plus postage).

Article of Food	*Limits recommended in ppm.* As	AS_2O_3
Beverages—		
Cider	0.2	0.26
Black beer	0.5	0.66
Soft drinks intended for consumption after dilution, concentrates used in the manufacture of soft drinks and undiluted fruit juices	0.5	0.66
Other Foods—		
Ice-cream, iced lollies and similar frozen confections	0.5	0.66
Dehydrated onions Dried hops Dried liquorice extract Edible gelatin (already prescribed Liquid pectin Chemicals (other than chalk) used as ingredients or in the preparation or processing of foods	2.0	2.6
Chalk (creta)	4.0	5.3
Chicory, dried or roasted	4.0	5.3
Dried herbs Finings and clearing agents Hop concentrates Solid pectin—all grades Spices	5.0	6.6
Food colourings other than synthetic colourings	5.0 on dry colouring matter	6.6 on dry colouring matter

Jamaica Alumina Plant to Expand

The productive capacity of the alumina plant in Jamaica is to be expanded from 230,000 tons to 300,000 tons a year to supply additional alumina requirements for the Kitimat aluminium smelter in Canada and other world markets. This was announced recently by Mr. N. V. Davis, president of Aluminium Limited, Montreal, during an inspection of the company's bauxite and alumina subsidiary, Alumina Jamaica Ltd.

Joint Venture in SA

FULL scale production of insulin has begun at Fordsburg, Johannesburg, and it is thus now being made in South Africa for the first time. This development is one of the first results of a new joint venture by the National Meat Suppliers (Pty.) Ltd., a subsidiary of the Imperial Cold Storage & Supply Co. Ltd., of South Africa, and Boots Pure Drug Co. Ltd., of Nottingham. These two organisations have formed a new company, Biochemico (1954) (Pty.) Ltd., and taken over a fine modern factory built in 1950 and some excellent modern plant. Boots were among the first British manufacturers of insulin and their technical knowledge combined with the excellent supply facilities for pancreas glands from the Imperial Cold Storage Company have produced quick results.

Perhaps the most noteworthy product of this new company is the steroid diosgenin. This is one of the most important raw materials used in the manufacture of cortisone. Diosgenin is extracted from *Testudinaria*, found in the north-eastern Transvaal and Cape Province. Fortunately the supply of these plants available in South Africa is very large. Boots are the largest manufacturers of cortisone and hydrocortisone in the United Kingdom and have been exporting these products to the Commonwealth and elsewhere for some time.

First crystalline insulin produced in Johannesburg. Holding the test tube is Mr. V. G. Fox, chairman of Biochemico (1954) (Pty) Ltd.

Indian Chemicals Report

THE Indian Heavy Chemicals (acids and fertilisers) Development Council has issued its annual report which contains recommendations for increasing nitrogen output and developing the use of pyrites for sulphuric acid.

The Council consisted of two sub-committees, one for fertilisers and the other for sulphur. The fertiliser sub-committee estimated that by 1957 requirements of various nitrogenous fertilisers would be about 173,000 tons of nitrogen a year, while output by the same year would only be 109,000 tons. The gap might actually be greater, so it is recommended that capacity for production of a further 100,000 tons of nitrogen a year should be planned.

As far as phosphatic fertilisers are concerned, the problem is one of increasing use rather than output. At present consumption is well below productive capacity.

In view of India's complete dependence on imported sulphur for making sulphuric acid, the council decided that alternatve resources, such as pyrites, gypsum, etc., should be explored. Occurrences of pyrites have been reported in several places in India, and indigenous pyrites are probably the cheapest source of sulphur, after imported rock sulphur. It was felt that recovery of sulphur from sulphates may be considered later, after more details were available as to the probable total deposits of pyrites in the Amjor area.

It is now proposed to set up a similar development council for the drugs and pharmaceutical industry.

UK Potash : I.C.I. Withdraw

Special Techniques Involved

THE board of Imperial Chemical Industries Ltd. has announced that it has been 'reluctantly decided' not to proceed with the development of the potash deposits in the Whitby area of North Yorkshire. After seven years of work, involving expenditure of over £400,000, says a statement from the firm, 'it has become clear that the winning of the deposits would present difficult problems which can only be solved by an organisation familiar with the special deep-mining techniques involved, which I.C.I., as a manufacturer of chemicals, does not possess.'

Discovery of Deposits

The discovery of the potash deposits in Yorkshire arose from the oil prospecting programme of the D'Arcy Exploration Company in 1938, in the course of which potash-bearing brine, as well as evidence of deposits of sylvinite (a mixture of sodium chloride and potassium chloride) were found in borings at Aislaby, near Whitby. I.C.I. had examined cores from the D'Arcy Company's borings and decided to put down boreholes shortly after the war to discover how much potash-bearing brine was available and to prove the extent of the deposits of sylvinite. All this work was done with the full knowledge and agreement of the Government Departments chiefly concerned —that is to say, the Ministry of Fuel and Power, the Board of Trade and the Ministry of Materials.

The borehole programme failed to find any promising potash-bearing brine but proved the existence of two beds of sylvinite, at depth from 3,500 to 4,500 ft., the lower bed extending over an area of 24 sq. miles and containing between 20 per cent and 40 per cent of potassium chloride. About 350,000,000 tons of potassium chloride can be regarded as the likely deposit proved: and assuming an extraction efficiency of 30 per cent, about 100,000,000 tons of potassium chloride, or 200 years' home consumption at present levels, can be regarded as existing in North Yorkshire.

The total number of boreholes sunk was eleven—the original one sunk by the D'Arcy Exploration Company, six sunk by I.C.I., and four by Fisons Ltd., who associated themselves with the exploration from 1948 onwards.

I.C.I. converted one of its boreholes into an experimental brinewell, and carried on trials for over sixteen months in an effort to recover potash by solution of the deposits. The technique of obtaining sodium chloride by forcing water into natural deposits, and so dissolving the salt, is highly developed in I.C.I., and it was hoped that a modification of this method, to suit the extraction of potassium chloride from the mixed deposit, might prove an economical means of recovery. Unfortunately, the brinewell experiment proved conclusively that potassium chloride could not economically be won in this way—no means could be found to produce a sufficient concentration of the potassium salt, due to the nature of the sylvinite, which consists of two salts of different solubility.

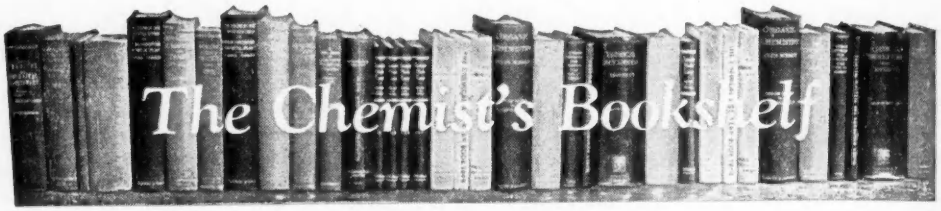
So far as mining is concerned, I.C.I. and Fisons Ltd. employed consultants to report upon the possibility of winning the potash by that method. Examination of their reports led I.C.I., however, to the conclusion that exploitation of the deposits could only be carried out by an organisation with extensive deep-mining experience.

Fison Ltd. have not yet come to any decision as to what they will do in the future. I.C.I. has made it clear that its geological and other technical information is now available to the Government or freely at the disposal of Fisons should they wish to proceed.

Competition in Canada

AS Canada's rapidly expanding chemical industry continues to grow it is finding itself more and more in the same position as the United States industry—faced with increasing competition from foreign producers, states the Purchasing Agents' Association of Toronto in its latest trade survey.

As far as paints are concerned, the survey says that titanium continues in short supply and that during the last two months prices have advanced 1½ cents per lb. due to higher prices for basic materials. The agents report that the outlook for the Canadian paint industry is favourable this year.



A SHORT TEXTBOOK OF COLLOID CHEMISTRY. By B. Jirgensons and M. E. Straumanis. Pergamon Press Ltd., London. 1954. Pp. xv + 420. 40s.

Unlike some recent textbooks in this field this book makes no secret of the fact that it aims primarily at setting out facts rather than theories. Basic relationships are not omitted but there is a minimum of theoretical speculation and an unusual attention to experimental method which will make it valuable to workers in many fields.

This book is a revised version of a similar textbook published in German in 1949 and appears to be aimed partly at workers in other branches of science such as medicine and pharmacy.

The text is divided into two parts, the first and much shorter part setting out the fundamental facts and elementary laboratory methods of classical colloid chemistry and the second dealing in turn with nearly all the important physico-chemical techniques which have been used in the colloid field. Light scattering, electrophoresis, the sedimentation methods, electron microscopy and X-ray analysis are all decribed in detail while there are separate chapters on lyophilic sols, gels and jellies, emulsions, and short sections on foams, fogs, smogs and solid sols. Strangely there is no account of the application of dielectric measurements to colloidal systems in spite of the success of the method, particularly in the protein field.

Efforts have been made to bring the subject matter up to date and references to work published as recently as 1952 and 1953 are frequent. In attempting to cover the whole field of colloid science in 420 pages, however, some sketchiness of treatment is inevitable. This is particularly noticeable in the chapter on emulsions where condensation has led the authors into explanations which are, to say the least, naive.

Nevertheless, this is a book which can be strongly recommended. University students at the Honours level will find it useful as a comprehensive guide to colloid science. It will appeal also to research workers who wish to have on their shelves a compact reference work in this field.—R. C. PINK.

THE CHEMISTRY OF LIPIDS OF BIOCHEMICAL SIGNIFICANCE. By J. A. Lovern. Methuen & Co. Ltd., London. 1955. Pp. 132. 8s. 6d.

The lipids are a heterogeneous collection of substances which form a large part of the composition of living organisms. Apart from the well-established function of the triglycerides as energy reserves, the biochemical role of the lipids is little understood. Perhaps the confusion which has existed over a rather arbitrary definition of lipids, coupled with the lack of knowledge of function, may account for the inadequate treatment which lipid chemistry usually receives in the textbooks. This little book goes a long way to remedy this deficiency. In it, the author has presented a well-balanced and up-to-date summary of the structure and chemistry of the triglycerides, phospholipids and sterols. A notable feature is a chapter on the preparation and analysis of lipids.

The chapters on the state of lipids in the tissues and turnover rates are particularly interesting to the biochemist; topics such as lipoprotein complexes have seldom before been reviewed so comprehensively in such a short space. The concluding chapter on the functions of the lipids shows how little relatively is known concerning the role of the phospholipids and sterols as structural elements in cellular architecture or as participants in metabolic processes. There is an extensive bibliography at the end of each chapter.

The book is a valuable addition to this excellent series of monographs on biochemical subjects and it will be welcomed both by research workers and students of general biochemistry.—E. R. REDFEARN.

HOME

Employment in December

The numbers employed in the chemicals and allied trades increased during 1954 and by the end of December had reached a total of 507,200, according to figures published in the Ministry of Labour Gazette. This compared with a figure of 494,800 in December of 1953, but was less than the November, 1954, total of 508,900.

No Room in Laboratory

Speaking at a dinner to mark the jubilee of the University Chemical Society on 4 March, Professor John Read, head of the chemistry department of St. Andrew's University, complained about the shortage of accommodation for his department. The last building addition to the chemistry department, he said, was in 1923. Since 1930 the congestion had steadily increased, and members of the staff had found the task of doing justice to their students becoming well-nigh insuperable.

Fatal Explosion at Works

At the time of going to press, the explosion at the Rutherglen works of British Chrome & Chemicals Ltd. had claimed four victims. The explosion occurred in the coal pulverising plant while firemen were fighting a fire on the night of 6 March. Three men were killed at once, and Mr. Harvey Riley, the assistant works manager, died later in hospital. The condition of 14 other men detained in hospital, including several firemen, was said to be serious.

Nutrition Panel Membership Growing

Membership of the Nutrition Panel of the Food Group of the Society of Chemical Industry continues to grow, says the annual report of the committee for 1954-55. On 1 January, 1953, there were 420 members, and the corresponding figures for 1954 and 1955 were 460 and 494 respectively. The annual general meeting will be on 23 March.

Evans Issue Fotogel

Evans Medical announce the issue of Fotogel, a new barium sulphate suspension which is stable and palatable. Each ml. contains 1 gram barium sulphate BP. Fotogel provides a fine dispersion of barium sulphate and may be mixed with water, milk, farinaceous foods or saline laxatives.

Watches for Long Service

Watches were presented to 100 I.C.I. employees at Billingham on 24 February for long service. For 24 employees the awards were for 30 years' service and for the others for 20 years. The presentations were made by Mr. J. W. Kerr, joint managing director (commercial).

Refining Plant Saved

A 3,500-gallon benzene washing tank caught fire at the Bitmac Ltd. plant in Dawes Lane, Scunthorpe, recently. Prompt action by local firemen prevented the blaze spreading to the whole refining plant.

Good Progress at Grangemouth

Forth Chemicals Limited announce that good progress is being made with doubling the capacity of their plant at Grangemouth for production of monomeric styrene. Due to the increased demand for this product, a project for still further expansion has already been authorised and is proceeding. The entire expansion project is due to be in operation early in 1956.

Synthetic Fibres Output Maintained

Output of all man-made fibres during January amounted to 38,200,000 lb., of which 19,300,000 lb. was staple fibre and 18,900,000 lb. continuous filament yarn. The figures issued by the Board of Trade refer to all man-made fibres, including Terylene and Ardil. Until December, 1954, the published figures referred to rayon and nylon only. The Board of Trade state that comparable figures for previous periods cannot be given, but it is likely that the January output was not less than that in December.

Symposium on Histamine

The Society of Chemical Industry Fine Chemicals Group announces that by courtesy of the Physiological Society and the British Pharmacological Society a limited number of invitations are available for the symposium on histamine which is being held in the Wellcome Building, 183-193 Euston Road, London N.W.1, on the afternoon of Monday, 4 April, and the morning and afternoon of 5 April. Those wishing to attend should apply to the group honorary secretary, J. D. Kendall, Ilford Limited, Ilford.

• OVERSEAS •

Indian Uranium Ore Plant

India is to set up a plant for the treatment of uranium ore near one of the deposits of low grade ore at Takshilla, Bihar. Other deposits of low grade ore have been found in Madras and Orissa.

Drop in Whale Oil Output

The Norwegian whaling expeditions in the Antarctic report that up to 5 February they had produced 317,900 barrels of whale oil. This production covers a period of 30 days. In the first 29 days of last season, production was 332,000 barrels.

New Source of Tungsten

Exploitation is being started of a new Turkish tungsten mine discovered at Sögut, near Bilecik, in Central Anatolia. The Turkish Mining Research Institute has stated that the ore found in the mine contains 4 per cent of tungsten.

Visakhapatnam Refinery to be Larger

The Government of India has approved a proposal to increase the capacity of the proposed oil refinery at Visakhapatnam from 500,000 tons to 675,000 tons of crude oil per year. In terms of daily production this will mean an increase from 10,000 barrels to 13,000.

Fertiliser Company Expands Production

Production of superphosphates by the Fertilisers and Chemicals Company of Haifa totalled 76,562 tons in 1954, compared with 34,963 tons during the preceding year. The production of sulphuric acid also showed an increase, rising from 17,336 tons to 43,928 tons during the same period.

Lead & Zinc Pigments

There was a further decline in domestic consumption of lead and zinc pigments and zinc salts during 1954, according to the US Bureau of Mines. The decreases are mainly attributed to a fall in the volume of business in industries that are important users of these products, although there were other contributory factors. In the paint industry, for example, there has been in recent years increased use of substitutes and a reduction in the pigment content of paint formulations.

Nickel Dearer in Canada

International Nickel Company of Canada has announced an increase in the internal price of nickel of 1.1 cents per lb. bringing it to 62½ cents per lb. The increase, which applies only to Canadian buyers, dates from 1 March.

Austrian Nitrogen Works Output

In 1954 the Linz Nitrogen Works, Austria, sold a total of 590,000 tons (metric), 7 per cent more than in 1953. The works raised production substantially by beginning operation of their new sulphuric acid and phosphate fertiliser factory.

Record World Rayon Output

Preliminary figures for world production of rayon and acetate during 1954 put the figure at 4,360,000,000 lb. This is 5¼ per cent above the 1953 total and sets a new record. For the first time since 1944 staple fibre output was more than that of filament yarn. The latter decreased by 4½ per cent due entirely to a large fall in US production.

Congress to Probe Rubber Plant Sales

Two US Congressional committees are to scrutinise the proposed sale of 24 Government-owned synthetic rubber plants to private buyers (see THE CHEMICAL AGE, 1955, **72**, 192). The sales become effective if Congress does not veto transactions by 25 March. Any opposition to the sales is likely to be based on the arguments that the plants are being sold too cheaply and that their disposition would tend to encourage monopolies.

Sicilian Sulphur Mines to Close

Because, it is claimed, they have been unable to pay their employees for months, the owners of Sicily's 360 sulphur mines have announced that they will close down on 20 March. The Government, they allege, has not kept its promise to help the industry, and there have been several strikes by workers who claimed they had not been paid their wages. The mine owners say they have huge stocks on their hands because they are unable to compete with the cheaper American sulphur.

· PERSONAL ·

MR. JAMES BONSER has been appointed to the board of Fleetwood Paints Ltd. and has become managing director. MR. STANLEY D. HALL has also joined the board. MR. N. M. JOHNSON has resigned as managing director but will continue to act as chairman. MR. BERNARD WARD TURNER has resigned from the board.

MR. R. GORDON MACTAGGART, president of Reichhold Chemicals (Canada) Ltd., announces the appointment of MR. WILLIAM G. AIRD of Toronto and MR. T. S. HODGKINS of Seattle to the board of directors. Mr. Aird is treasurer of the company and Mr. Hodgkins is a vice-president, managing the Western Division with plant offices at Port Moody, BC.

Among recipients of the honorary degree of Doctor of Laws at the summer graduation of Aberdeen University in July will be SIR THOMAS MERTON, M.A., D.Sc., F.R.S., formerly Professor of Spectroscopy in the University of Oxford, and treasurer and vice-president of the Royal Society.

DR. FARRINGTON DANIELS, chairman of the University of Wisconsin chemistry department and internationally known authority on atomic and solar energy, will be awarded the 1955 Willard Gibbs medal, one of the highest honours an American chemist can be given. The award, founded in 1910, is conferred on Dr. Daniels 'because of his eminent work in, and original contributions to, pure and applied chemistry.'

AIR MARSHAL SIR VICTOR GODDARD, K.C.B., C.B.E., has joined Elliott Brothers (London) Ltd., as an Assistant (Air) to the managing director.

MR. EUGENE EASTERLY has been appointed vice-president—distribution, and MR. E. G. HICKLING, vice-president—operations, of Linde Air Products Company, a division of Union Carbide and Carbon Corporation. Mr. Easterly joined Linde as a development engineer at Linde's Buffalo laboratory in 1931, and Mr. Hickling began his career with the company in 1927 as an engineer at the same laboratory.

MR. and MRS. HENRY WILSON, of Shipley, formerly of Heaton, Bradford, celebrated their golden wedding on 5 March. A member of an old Halifax family, Mr. Wilson is well known in the Bradford, Huddersfield and Halifax districts. He is chairman of Cole & Wilson Ltd., colours and chemicals, Greenhead Road, Huddersfield, a business which he started in 1920 in partnership with the late Mr. Percy Cole. Mr. Wilson became a student in the chemistry and dyeing departments of Bradford Technical College in 1894 and later travelled for the Bayer Company.

MR. C. G. KILLPACK, who joined Lederle Laboratories Division, Cyanamid Products Ltd., in April last year, has been appointed sales manager: his appointment dates from 1 February. While still retaining his position as sales manager of the animal feed and veterinary departments, Mr. Killpack is now also responsible for sales promotion of the extensive range of Lederle ethical medical specialities, including aureomycin and Achromycin.

The Senate of the University of Dublin is to confer the honorary degree of D.Sc. upon PROFESSOR G. R. CLEMO, D.Phil., D.Sc., F.R.I.C., F.R.S., Professor of organic chemistry in the University of Durham, King's College.

The inaugural meeting of the Midlands Section of the Society for Analytical Chemistry was held on 22 February, when the following officers were elected: *chairman*, MR. J. R. LEECH, J.P.; *vice-chairman*, DR. R. BELCHER, B.Sc., Ph.D., F.R.I.C., F.Inst.F.; *hon. secretary*, MR. G. W. CHERRY, M.A., B.Sc. (48 George Frederick Road, Sutton Coldfield, Warwick); *hon. treasurer* MR. F. C. J. POULTON, A.R.I.C. The section was formerly the Midlands Society for Analytical Chemistry (see THE CHEMICAL AGE, 1955, **72**, 435).

MR. C. W. VERNON, works manager of the chemicals factory of the Nobel division of Imperial Chemical Industries at Dumfries, was presented with an oil painting and gifts of money from employees to mark his retirement on 28 February.

The British Match Corporation announces that MR. JOSEPH H. G. REED, who will be 75 in April, is to relinquish the position of deputy chairman on 31 March. He will retain his seat on the board, and will be succeeded in the position of deputy chairman by SIR ANTHONY J. ELKINS.

Obituary

The death has occurred of MR. JOSEPH P. POSTLETHWAITE, joint managing director of Coalite and Chemical Products Ltd. He was 62. Elected to the board in 1946, Mr. Postlethwaite was appointed joint managing director of all the various companies in the group in 1949. He was elected a member of the Institute of Mechanical Engineers in 1934 and the Institute of Fuel in 1944.

The death occurred on 3 March of MR. ARNOLD LEVY at the age of 68. Managing director of the Itshide Rubber Co., he was active in the British Rubber Manufacturers' Research Association and the Institution of the Rubber Industry, as well as the Federation of British Industries.

US Award for Briton

SHORTLY before leaving America to attend the Symposium of the Corrosion Group of the Society of Chemical Industry in London from 30 March to 1 April, Mr. F. L. La Que will be charged with a special commission by the National Association of Corrosion Engineers. It is to convey this year's Whitney Award to Dr. W. H. J. Vernon, O.B.E., who recently retired from his post as head of the Corrosion Section of the Chemical Research Laboratory of DSIR.

The formal announcement of the award was made at the Association's annual dinner at Chicago on 9 March, and Mr. La Que, who is vice-president and manager of the Development and Research Division of the International Nickel Co. Inc., will make the actual presentation on the occasion of delivering the Corrosion Group's Spring Lecture for 1955 on the evening of Wednesday, 30 March, at Church House, Westminster.

The Whitney Award, presented annually by the NACE for distinguished contributions to corrosion science, has only once previously come to this country, when Dr. U. R. Evans was the recipient in 1948.

Canadians to Build in US

A GROUP of Canadian industrialists have announced plans for a $15,000,000 ammonia plant to be built in the Pine Bend area just south of St. Paul, Minnesota, along the Mississippi River.

Robert Campbell, of Vancouver, BC, acting president of the newly incorporated St. Paul Ammonia Products Co. of St. Paul, Minn., said the plant will be geared to production of nitrate fertilisers for farming, and ammonia and nitrogen solutions for both agriculture and industry.

Mr. Campbell said the Lummus Corp. of America has been awarded the contract to plan and build the plant. It is expected to be ready in fourteen months.

The new structure will adjoin the site of the $25,000,000 Great Northern Company oil refinery currently in the process of construction. Mr. Campbell said the ammonia product will be manufactured from natural gas and residual oil from the refinery, to be serviced by a pipeline from Saskatchewan. The plant will go up on 250 acres on which the new company recently took an option.

The same group of industrialists is planning a similar installation in Montreal under the name of Quebec Ammonia Co. Ltd., also expected to be started this spring.

Plant Completed

THE phosphorus plant of the Electric Reduction Company of Canada Ltd., at Varennes, Quebec, which came into production in late 1953, has now been completed and it includes facilities for handling both raw materials and the finished product. The first year's operations have been completely satisfactory and the company announced that prospects for 1955 are excellent.

At the Buckingham, Quebec, site a new plant for the production of sodium hexametaphosphate has just been completed. This material, which will be marketed under the trade name Ercophos, is mainly used for softening water, dispersing paper coating clays and making dish-washing compounds. The capacity of the plant is said to be sufficient to supply the full requirements of the Canadian market.

The domestic sales of the Electric Reduction Company have shown an appreciable increase in 1954 over 1953. Sales on the export markets have also materially increased.

Publications & Announcements

EVANS MEDICAL SUPPLIES LTD. have been appointed sole pharmaceutical and veterinary distributors for Comprox, a liquid detergent marketed by Irano Products Ltd., a subsidiary of British Petroleum Ltd. (formerly the Anglo Iranian Oil Company). Comprox is a product of the Scottish shale oil industry and is a relatively new member of the sodium alkyl sulphate group of liquid detergents. It is in a concentrated form, making it economical to use. It is amber in colour, neutral in reaction, practically odourless and is said to have unique cleansing properties for cleaning glassware, benches, tiles, floors, etc. Descriptive leaflets are available on request from the company's establishments at Liverpool, London, Newcastle and Swansea, as well as from Evans Medical's Glasgow agents, The New Apothecaries Co. Ltd. Comprox is available in 2 litre bottles and 4 gal. drums.

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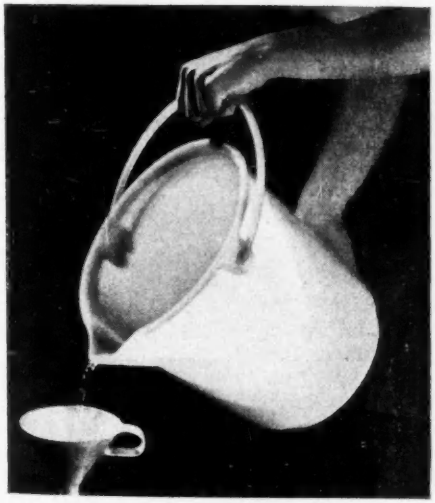
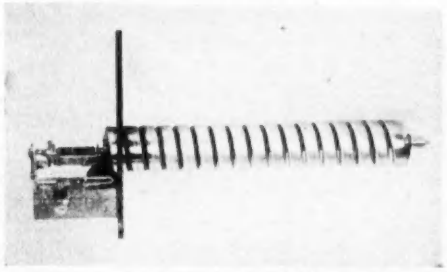


This new 'Bex' polythene pail, made by the Halex Division of British Xylonite, has been designed primarily for industrial and institutional purposes. Larger than the original domestic model, it holds 2½ gallons and has a heavy quality steel handle completely encased in polythene, giving full protection against acids and other corrosive fluids. It is calibrated on the inside in gallons and litres. Colours are green, red and ivory

A NEW range of pressure elements known as the 200 Series has recently been introduced by Foxboro-Yoxall Ltd., Lombard Road, London S.W.19, and one of these, Type 250 heavy duty helical, is shown in the accompanying illustration. The extensive research which preceded its development was directed towards perfecting a



manufacturing technique which would produce an element capable of measuring the very highest pressures with sustained accuracy, long life and high safety factors. Thus this new helical element will measure pressures up to 80,000 psi., higher than has hitherto been possible by mechanical means. The element is built of a molybdenum-bearing stainless steel and has exceptional power and stability and is particularly suited to the measurement of continuously fluctuating pressures in the very high ranges. The excellent corrosion resisting properties of the stainless steel also mean that the Type 250 can be used in many applications where corrosive vapours may be present. Care has been taken to minimise the possibility of damage through overranging and wide safety margins are provided. For example, an element for the range 0-10,000 psi. may be overranged in safety to 18,000 psi. A further feature is the provision of expanded scale reading, an element designed for 9-500 psi. having a range from 9,000-10,000 psi., with the result that the clarity and accuracy of the readings are greatly improved.

* * *

OVERPRODUCTION is a feature of ethical pharmaceutical manufacture in the United States, according to a handbook, *Economic Aspects of the Pharmaceutical Industry*, prepared by R. S. Aries & Associates, of 270 Park Avenue, New York. 'Ethical pharma-

ceutical manufacturers have gone on a wild orgy of duplicating promising pharmaceutical preparations of their competitors whenever the lack of patent coverage permitted, and more limitedly when patent coverage did not permit but licensing arrangements could be made,' says the handbook. Increased competition from abroad has made the domestic industry increasingly more competitive. Exports have declined and imports from other countries, particularly Switzerland, have increased. In spite of all this, it is concluded that, even without any spectacular developments, increasing lifespan and growing world population should permit the industry a steady growth which should result in higher sales.

* * *

A NEW technical booklet on isopropanol has just been released by Carbide & Carbon Chemicals Company, a Division of Union Carbide & Carbon Corporation. The 16-page booklet has been prepared for chemists, engineers, purchasing agents, and production and laboratory personnel. It contains information on the uses, physical and physiological properties, shipping data, specifications, and constant-boiling mixtures of isopropanol. Thirteen graphs on vapour pressures, specific gravities, freezing points, viscosities, and other important physical properties make this an excellent reference book. Isopropanol has many applications as a solvent, extractant, intermediate, germicide, and gasoline additive. The isopropyl xanthates are useful in mineral flotation processes. Copies of the new booklet (F-8731), are available from any of Carbide's 25 offices or Carbide & Carbon Chemicals Company, 30 East 42nd Street, New York 17, New York.

* * *

FOXBORO-YOXALL Ltd., Lombard Road, London S.W.19, are at present building a range of graphic panels which are interesting examples of the latest trends in control panel design. One made to the order of the Lummus Company was recently shipped to Ras Tanura in Saudi Arabia for installation in the Arabian American Oil Company's refinery there. It is 47½ ft. long by 7½ ft. high and was designed to control fluid catalyst hydroformer and its auxiliary plant including feed preparation and charge heater, reactor and regeneration and distillation and refractionation sections. The layout of the plant being controlled is depicted graphically on the panel by suitably coloured cut-out symbols and 'D' section lines so that the position in the process of any instrument may be seen at a glance. Recent developments in the methods of attaching these symbols and lines to the panel permit their removal and rearrangement without damage to the surface should any change in the plant layout subsequently occur. The size and intricacy of this panel may be judged by the fact that, quite apart from the plant connections, more than 45,000 ft. of wiring and 3,000 ft. of copper tubing were needed to link the principal instruments, numbering more than 140. These included 83 Model 53 Consotrol recorders and 30 Model 58 Consotrol controllers. In addition to the controlling, indicating and recording functions there are comprehensive automatic alarm systems for each section and an overall plant shut-down alarm. In the construction of these large graphic panels, Foxboro-Yoxall Ltd. have paid particular attention to the question of their easy and rapid installation at overseas plants where it may be impossible or undesirable to have more than the minimum technical personnel. To this end these panels are completed in the factory with all the instruments fitted in position and linked up. Final installation on the site is thus only a matter of connecting the air pressure and electric supplies and linking up the impulse lines from the plant.

* * *

REPRINT of an address given at the 9th International Congress on Packaging held at Parma in September 1954 is 'Some Recent Advances in Tinplate Manufacturing Processes' by W. E. Hoare (Pp. 27), published by the Tin Research Institute, Fraser Road, Perivale, Middlesex. The paper is a review of the present stage of development of tinplate manufacturing methods. The section on electrolytic tinplate describes all the processes used and the differences in the products. There is a chart showing the production method operating in each electrolytic tinplate works throughout the world. Hot-dipped tinplate production methods are everywhere being brought into line with the latest technical developments. Some of the methods in use for testing coatings on tinplate are also mentioned. There are twelve photographic illustrations.

A NEW YORK COMPANY

Well Established in the

PETROLEUM, SOLVENTS, CHEMICALS

AND PHARMACEUTICAL BUSINESS

has recently acquired a new site, the facilities and acreage of which exceed their own immediate requirements. They are, consequently, in a position to offer factory accommodation and storage space to British Companies interested in developing or consolidating their sales or manufacturing interests in the United States.

The New York Company with their existing plant could import, refine, pack and distribute in bulk any suitable Chemical or Petroleum product, solid or liquid, and provide or lease any labour or material required supplementary to these activities.

The New York Company could store, process, break down, import or export any commodity in bulk under conditions completely under the British Company's control.

The excess accommodation not required by the operators, being of substantial capacity, may well be utilised by a British Company considering the erection of a pilot plant, and interested parties are invited to discuss such a proposal, whilst the site is also ideal for employment as an embryo warehousing, distribution or assembly centre.

The location is in New Jersey, approximately 30 minutes by road from mid-town New York, and the installation is capable of receiving and loading goods by road, rail or river transport.

Enquiries, which will be treated in strict confidence, should be addressed to the Managing Director.

RUMEX OIL PRODUCTS LIMITED

155, Fenchurch Street, London, E.C.3.

Law & Company News

Changes of Name

The following changes of name have been announced: BRITISH CHROME & CHEMICALS LTD. to BRITISH CHROME & CHEMICALS (HOLDINGS) LTD., on 15 December; BRITISH CHROME & CHEMICALS (MANUFACTURING) LTD. to BRITISH CHROME & CHEMICALS LTD., on 31 December; MIDLAND SILICONES LTD. to MIDLAND SILICONES (SALES) LTD., on 15 December; DOW CORNING LTD. to MIDLAND SILICONES LTD., on 15 December; ASSOCIATED TECHNICAL MANUFACTURERS LTD. to PERMANOID LTD., on 13 December; PHYLAX SERUM LABORATORIES LTD. to CHEMOSAN LTD., on 16 December; CLENSOL LTD. to CLENSOL LTD., on 3 January; LAWFER CHEMICAL CO. LTD., to HOECHST CHEMICALS LTD., on 6 January; R. NOBLE & SON LTD., to CHEMICAL EXTRACTIONS LTD., on 10 January; DR. EARL S. SLOAN LTD., to CHAMBERLAIN CHEMICAL CO. LTD., on 14 January.

Increases of Capital

The following increases in capital have been announced: MIDLAND SILICONES LTD., from £25,000 to £1,150,000; POLYSULPHIN CO. LTD., from £19,000 to £24,500 PAROXITE (LONDON) LTD., from £1,000 to £5,000; GLAXO LABORATORIES LTD., from £3,000,000 to £5,000,000.

Company News

Dorman Long & Co. Ltd.

The statement of the chairman and managing director of Dorman Long & Co. Ltd., Sir Ellis Hunter, says that group profit before taxation but after other deductions amounted to about £6,237,000. This compares with the estimate of £6,000,000 in the offer for sale. The main trading activities of the group contributed to the profit in the following approximate proportions: iron and steel, 51 per cent; bridge building and engineering 45 per cent; and chemicals 4 per cent. During the year resin production was increased at the Clarence Chemical Works. Demand for the pure compounds resulting from benzole has been high and in particular large quantities of pure benzole have been sold to the nylon and styrene industries. A new boiler plant has been brought into operation giving lower cost of steam at comparatively high pressure. Good progress has been made with the construction of the new tar and benzole plants to handle the increased materials which will come from the coke ovens now building at the Cleveland Works. Considerable economies and improved production are expected from the operation of this modern equipment in 1956.

Aluminium Corporation Ltd.

Trading profits of the Aluminium Corporation Ltd. rose in 1954 to £147,631, compared with £49,994 in the previous year. Net profit was £52,466 (£3,535), and the board recommends a 17½ per cent dividend for the year.

Bradford Dyers' Association

Total consolidated income of the Bradford Dyers' Association in 1954 was £2,414,008, compared with £2,497,399 in the previous year. The final dividend is being cut from an equivalent of 7½ per cent to 6 per cent, making a total for the year of 10 per cent. The previous year's payment was 15 per cent on a smaller capital which is equivalent to 10 per cent on the present capital.

Benzol & By-Products Ltd.

An application by Benzol and By-Products Ltd. for the adjustment of the respective interests of ordinary and preference shareholders in the company's assets will be heard by a tribunal, established under the Coal Industry Nationalisation Act, on 22 March. The tribunal will also hear objections to the company's plans. The directors proposed that preference holders should receive 30s. per cent, together with arrears of fixed cumulative dividend and that ordinary holders should be entitled to the remaining assets, which would give about 15s. per ordinary share. These proposals did not receive the necessary 75 per cent approval by either class of shareholder.

The Distillers' Co. Ltd.

The directors of The Distillers Co. Ltd. have received the consent of the Capital Issues Committee to the proposed capitalisation of reserves in writing up the 4s. units to 6s. 8d. each, equivalent to a 66⅔ per cent free issue.

Willows Francis Ltd.

The directors of Willows Francis Ltd. are increasing the interim dividend to 7½ per cent (5 per cent last year).

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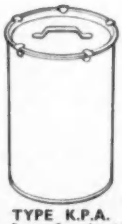

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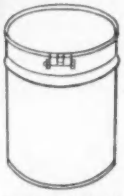

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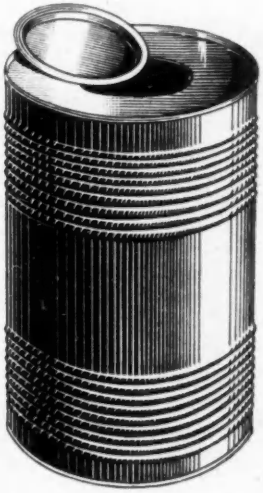

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Next Week's Events

MONDAY 14 MARCH

Royal Society of Arts

London: John Adam Street, Adelphi, W.C.2, 6 p.m. First of three Cantor Lectures on 'The Mechanical Properties of metals': 'Tensile Properties' by Dr. H. Ford (succeeding lectures on 21 and 28 March).

Royal Institute of Chemistry

Leeds: Chemistry Lecture Theatre, The University, 6.30 p.m. 'The Biochemistry of the Marine Algæ' by Dr. F. N. Woodward.

Chemical Society

Durham: Science Laboratories, The University, 5.15 p.m. 'New Developments in Analytical Chemistry' by Dr. R. Belcher.

Institute of Fuel

Newcastle-on-Tyne: Chemistry Lecture Theatre, King's College, 6.30 p.m. 'Wind and Solar Energy' by Professor P. A. Sheppard.

TUESDAY 15 MARCH

Royal Institute of Chemistry

Hatfield: Technical College, Roe Green, 8 p.m. 'Synthesis in the Ergot Alkaloid Field' by Dr. A. Cohen.

SCI (Chemical Engineering Group)

London: Geological Society, Burlington House, W.1, 'Correlations for Use in Transport of Aqueous Suspensions of Fine Solids through Pipes' by K. E. Spells, 'Experiments on the Flow of Sand-Water Slurries in Horizontal Pipes' by R. A. Smith, and 'Hydraulic Conveying' by C. J. Richardson (joint meeting with Institution of Chemical Engineers).

Institute of Physics

London: Institute's House, 47 Belgrave Square, S.W.1, 5.30 p.m. Electronics Group annual general meeting, followed by 'The Luminescence of Solids in the Infra-Red Region' by Dr. G. F. J. Garlick.

Institute of Fuel

Birmingham: James Watt Institute, Great Charles Street, 6 p.m. 'Selection and Use of Fuels in a Modern Engineering Heat Treatment Department' by H. Oxley.

Plastics Institute

Manchester: College of Technology, 6.30 p.m. 'New Kinds of Macromolecules' by Professor H. W. Melville.

WEDNESDAY 16 MARCH

Royal Institute of Chemistry

London: Chemistry Lecture Theatre, King's College, Strand, W.C.2, 6.30 p.m. 'Recent Advances in Photography' by Dr. H. Baines (with London Section, SCI).

Institution of Chemical Engineers

Manchester: College of Technology, 7 p.m. 'Instrumentation of a Nuclear Power Plant' by P. V. Koller.

Institute of Fuel

Sheffield: Royal Victoria Station Hotel, 2.30 p.m. 'Smoke and the Law' by A. Marsh.

Society of Instrument Technology Ltd.

Sheffield: University Buildings, St. George's Square, 7 p.m. Annual general meeting of South Yorkshire Section, followed by 'Some Instrumentation Problems in the Iron and Steel Industry' by B. O. Smith.

SCI (Plastics & Polymer Group)

Darlington: The Technical College, 7.30 p.m. 'The Development of Oil Cracking as a Source of Raw Materials for the Plastics and Polymer Industries' by Dr. J. W. Woolcock (joint meeting with Newcastle-on-Tyne Section).

Society for Analytical Chemistry

London: 'The Feathers', Tudor Street, E.C.4, 6.30 p.m. Microchemistry Group, discussion meeting on 'The Direct Determination of Oxygen in Organic Substances'.

THURSDAY 17 MARCH

Royal Institute of Chemistry

Chatham: Medway College of Technology, Maidstone Road, 7.30 p.m. 'The Art and Science of Motor Spirit Manufacture' by Dr. W. Osborn (with London Section, SCI).

Chemical Society

London: Society's Rooms, Burlington House, Piccadilly, 7.30 p.m. Pedler Lecture. 'Some Problems in the Chemistry of the Hemicelluloses' by Professor E. L. Hirst.

Aberdeen: Robert Gordon's Technical College 7.30 p.m. 'Fluorescence of Solutions' by Dr. E. J. Bowen (joint meeting with RIC and SCI).

Bristol: Chemistry Department, The University, 7 p.m. 'Recent Advances in Photography' by Dr. H. Baines (joint meeting with RIC and SCI).

continued on page 658

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Next Week's Events

continued from page 656

SCI (Microbiology Group)

London: Medical Society of London, 11 Chandos Street, W.1, 6.15 p.m. 'The Lesser Known Antibiotics' by Dr. M. Lumb.

FRIDAY 18 MARCH

Chemical Society

Glasgow: The University, 7.15 p.m. 'The Shapes of Molecules' by Dr. J. W. Linnett.

SCI (Corrosion Group)

Liverpool: Chemistry Lecture Theatre, The University, 7 p.m. 'Control of Corrosion in Boilers' by P. Hamer (joint meeting with Liverpool Section).

SCI (Fine Chemicals Group)

London: Westminster Medical School, 17 Horseferry Road, S.W.1, 6 p.m. Discussion on 'Chemical Aspects of Thyrotoxicosis'.

Monsanto Phosphates

SODIUM phosphates and other phosphorus compounds will be produced by a new wholly-owned subsidiary company of Monsanto Chemicals Ltd., to be known as Monsanto Phosphates Ltd. The new company will erect and operate plants in Great Britain and the first one will be a major installation at Newport, Monmouthshire, for producing sodium polyphosphate used mainly for detergent applications.

This new development of Monsanto Chemicals Ltd. will be backed by 'know-how' in phosphate technology which is available from its American associates, Monsanto Chemical Company, the world's largest producers of elemental phosphorus.

In addition to these proposed activities in the United Kingdom, Monsanto Phosphates Ltd. will administer the present interest of Monsanto Chemicals Ltd. in the Tororo Exploration Co. Ltd.

General manager of the new company will be Mr. J. M. Kershaw. The directors will be Dr. J. W. Barrett, Mr. D. R. Mackie, Mr. H. S. Parry, Mr. N. F. Patterson, Mr. D. C. M. Salt and Mr. P. A. Singleton.

The Tororo Exploration Co. Ltd., in which Monsanto Chemicals Ltd., Frobisher Ltd. and the Uganda Development Corporation Ltd. each have a one-third interest, was formed in 1953 to develop economic methods for the working up and utilisation of important phosphate deposits in Uganda.

Market Reports

LONDON.—The demand for industrial chemicals on home account shows no sign of diminishing, and it remains to be seen if the recent high level of productivity in the chief consuming industries can be sustained through increased exports. A good flow of new business has been reported during the past week, interest being spread over most sections of the market. There has also been a substantial volume of inquiry for shipment, much of which is for products in short supply. The price position on the whole is firmer with quotations being adjusted to cover higher costs. (Certain price increases were given on page 586 in last week's issue.) Cream of tartar is dearer by 20s. per cwt. The prices of non-ferrous metal compounds are unchanged and remain steady at recent levels. There has been no outstanding feature in the coal tar products market and most products are well sold forward. Crude carbolic acid and phenol crystals are in brisk demand.

MANCHESTER.—A fair demand against contracts for textile bleaching, dyeing and finishing chemicals has been reported on the Manchester market during the past week, and other leading industrial users in Lancashire are absorbing a good aggregate quantity of caustic soda and other alkalis, as well as the potash, ammonia and magnesium compounds. Replacement business during the week has been on a fair scale and prices generally are on a steady to firm basis. There has been little change in the position of fertilisers, with the demand for the compounds and some other descriptions on reasonably steady lines. A good demand for most of the by-products continues.

GLASGOW.—Business on the whole during the past week has been very brisk in most sections of the chemical industry, with a fair volume of business booked for forward delivery. Export, if anything, has been a shade busier with a fair number of inquiries being received.

Oil Plant Orders Up

British firms received orders for oil equipment and materials worth £80,392,200 during 1954. This was £13,000,000 more than in 1953 and of the total, £20,771,000 was for bulk chemicals. A large part of the orders came from overseas.

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SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 inclusive, or a woman aged 18-59 inclusive, unless he or she, or the employment, is excepted from the provisions of the Notifications of Vacancies Order, 1952.

A VACANCY occurs on the editorial staff of **THE CHEMICAL AGE** for sub-editor-reporter. Experience of Industrial Chemistry desirable; ability to write lucidly essential. Apply, in writing, giving full details of experience and salary expected, to the **MANAGING DIRECTOR, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

BRITISH INDUSTRAL SOLVENTS

A Division of The Distillers Company Limited, manufacturers of bulk organic chemicals, invites applications for the post of **GENERAL SALES MANAGER** to take over administrative responsibility for Home and Export Sales. It should be emphasised that the post is one for a top ranking executive, and only applicants who have a wide commercial experience in the Chemical Industry in the U.K. will be considered. Preferred age, 37-47. Salary will be the subject of negotiation. Applications will be dealt with in strict confidence by the Division Managing Director, and should be addressed in envelopes marked "Private and Confidential," to :—

Division Managing Director,
British Industrial Solvents,
Devonshire House,
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for their Home Sales Department in London. Applicants should be between 25 and 35 years of age, and have commercial experience of the Chemical Industry. Technical background would be an advantage. Salary according to age and experience. Pension Scheme. Applications to the Personnel Manager, British Industrial Solvents Devonshire House, Mayfair Place, Piccadilly, London, W.1.

ENGINEER required for Heavy Chemical Works in S.W. Lancs. A.M.I.Mech.E. and A.M.I.E.E. preferred. A good knowledge of Chemistry would be an advantage. Good salary and prospects for the right man. Contributory Pension Scheme. Write, giving full details of experience and qualifications, to **McKECHNIE BROTHERS, LTD., P.O. BOX 4, WIDNES, LANCS.**

SITUATIONS VACANT

EXPERIMENTAL OFFICERS AND ASSISTANT EXPERIMENTAL OFFICERS in various Government Departments. The Civil Service Commissioners invite applications for pensionable posts. Applications may be accepted up to 31st December, 1955, but forms should be returned as soon as possible as an earlier closing date may be announced either for the competition as a whole or in one or more subjects. Applications from meteorologists must be received by 31st May, 1955. Interview Boards will sit at frequent intervals.

The posts are divided between following main groups and subjects (*a*) Mathematical and Physical Sciences, (*b*) Chemistry and Metallurgy, (*c*) Biological Sciences, (*d*) Engineering subjects and (*e*) Miscellaneous (including, *e.g.*, Geology, Library and Technical Information Services).

AGE LIMITS: For Experimental Officers, at least 26 and under 31 on 31st December, 1955; for Assistant Experimental Officers at least 18 and under 28 on 31st December, 1955. Extension for regular service in H.M. Forces. Candidates aged 31 or over with specialised experience for Experimental Officer posts may be admitted.

Candidates must have at least one of a number of specified qualifications. Examples are Higher School Certificate, General Certificate of Education, Scottish Leaving Certificate, Scottish Universities Preliminary Examination, Northern Ireland Senior Certificate (all in appropriate subjects and at appropriate levels), Higher National Certificate, University Degree. Candidates taking their examinations in 1955 may be admitted. Candidates without such qualifications may be admitted exceptionally on evidence of suitable experience. In general a higher standard of qualification will be looked for in the older candidates than in the younger ones.

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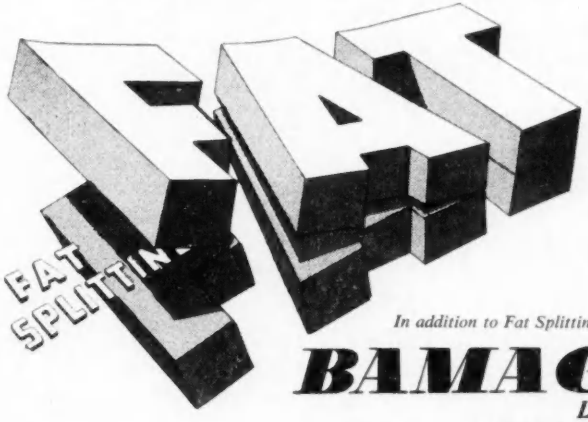

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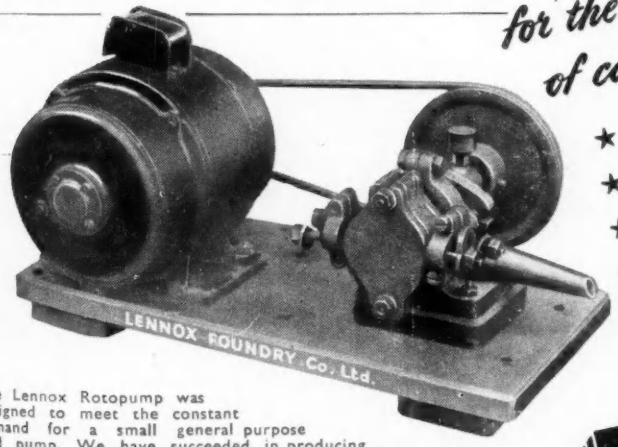

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